Sample Questions For Mathematics 109

(1) Multiply out: $(x^2 + 5x) \cdot (x - 3 + \sin x)$.
(2) Factor $x^3 + 5x^2 - 2x - 24$ completely.
(3) Find the solution set for the equation $x^3 + 5x^2 = 2(x + 12)$.
(4) Find the solution set for the inequality $x^3 + 5x^2 \leq 2(x + 12)$.
(5) Sketch the graph of the equation $x^2 + 6x + y^2 + 25 = 10y$.
(6) Verify the identity $\dfrac{\sin x}{1 + \sin x} = \dfrac{(1 - \sin x)\sin x}{\cos^2 x}$.
(7) Find $\sin(7\pi/6)$, $\cos(7\pi/6)$ and $\tan(7\pi/6)$ exactly. *Note that a calculator approximation is insufficient, and you need to show exactly how you obtained these values.*
(8) Suppose $\sin\theta = -0.3$ and $3\pi/2 \leq \theta \leq 3\pi$. Find exact values for $\sin(\theta+\pi)$, $\cos(\theta+\pi)$ and $\tan(\theta + \pi)$. Note again that a calculator approximation is insufficient.
(9) A building casts a shadow 40 feet long when the angle of elevation of the sun is 65°. How tall is the building?
(10) \$500 is placed in a bank account paying interest at an annual rate of 2.5%, compounded monthly. How long will it take for the balance to double to \$1000?
(11) How many quarts of a 5% acid solution must be added to 25 ounces of a 32% acid solution in order to obtain a solution that's 20% acid?
(12) Express $\left(2.73/\sqrt{3.1} - \dfrac{2.4 \cdot 5.1^2 - 2.8 \cdot 7.2}{8.9 - 5.3 \cdot 2.1}\right)^3$ in decimal form.
(13) Simplify $\left(\dfrac{x^3 y^{-4/3} z^2}{xy^2 z^3}\right)^{-3}$ as much as possible, rewriting it without using any fractional or negative exponents.
(14) Simplify $(\sqrt{x + y})^6$ as much as possible, rewriting it without using any fractional or negative exponents.
(15) Multiply: $(5x - 3\sqrt{x}) \cdot (\sqrt{x} + 3)$. Express the product as simply as possible.
(16) Multiply: $(x^3 + 8x + 15) \cdot (x - 3)$. Express the product as simply as possible.
(17) Factor completely: $x^2 - 2x - 48$.
(18) Factor completely: $x^3 - 3x^2 - 28x + 60$.
(19) Solve the following equation: $7x + 5 = 12x + 33$.
(20) Solve the following equation: $5x^2 + 6x - 17 = 3(x^2 + x + 1)$.
(21) Solve the following equation: $x^3 + 10x^2 + 3x = 54$.
(22) Solve the following inequality: $x^3 + 10x^2 + 3x \leq 54$.

Sketch the graphs of the given function or equation. Plot as few points as possible, and *clearly explain how you obtained the graph.*
(23) $2x^2 + 12x + y^2 - 14y = 14$
(24) $2x^2 + 12x + y^2 + 14y = 14$
(25) $3x + 8y = 48$
(26) $2x + 5y^2 = 20y$
(27) Solve the equation $x^3 + 3x^2 = 6x + 8$.
(28) Solve the inequality $x^3 + 3x^2 < 6x + 8$.
(29) Find the quotient $(x^5 - 2x^4 - 22x^3 + 37x^2 - 11x + 5) \div (x - 5)$.

(30) Simplify as much as possible: $\dfrac{\dfrac{1}{2x+5}-\dfrac{1}{11}}{x-3}$.

(31) Mark Spitz generally walks at a speed of 5 miles per hour and swims recreationally at a speed of 4 miles per hour. Walking along one bank of a river 11.6 miles wide, he realizes that he needs to get to a point on the opposite bank exactly 10 miles upstream. He walks a bit further before diving into the water and swimming straight to where he needs to go. If the entire process takes him exactly 3.885 hours, how far did he walk and how far did he swim? *Ignore the effect of any current.*

(32) Della can scrape the barnacles from a 70-ft yacht in 10 hours using an electric barnacle scraper. Don can do the same job in 15 hours using a manual barnacle scraper. If Don starts scraping at noon and Della joins him at 3 P.M., then at what time will they finish the job? *Assume that they each work at a constant speed never stopping for a snack, siesta, or food of any kind.*

(33) Solve the following equations.

(34) $3^{2x+5} = 15$

(35) $\ln(2x+5) = 15$

(36) \$532.00 is placed in a bank account which pays interest at an annual rate of 3.25% and just left there to accumulate.

(37) If interest is compounded monthly, what will the balance be after thirteen years?

(38) If interest is compounded continuously, what will the balance be after thirteen years?

(39) A small fortune is placed in a bank account which pays interest at an annual rate of 3.75% and just left there to accumulate.

(40) If interest is compounded monthly, how long will it take for the balance to double?

(41) If interest is compounded continuously, how long will it take for the balance to double?

(42) A right triangle has one leg of length 23 and a hypotenuse of length 34. Solve the triangle. *Recall that solving a triangle involves finding the lengths of all the sides and the magnitudes of all the angles.*

(43) A right triangle contains a 57 degree angle and a hypotenuse of length 45. Solve the triangle.

(44) A triangle contains sides of length 17 and 23 surrounding an angle of 64 degrees. Solve the triangle.

(45) When the sun is at an angle of elevation of 85 degrees, it casts a shadow 72 feet long. How tall is the building?

(46) Without using a calculator, find $\sin 4\pi/3$, $\cos 4\pi/3$, and $\tan 4\pi/3$.

(47) Without using a calculator, find $\sin 11\pi/4$, $\cos 11\pi/4$, and $\tan 11\pi/4$.

(48) Consider an angle θ such that $\sin\theta = .4$ and $\pi/2 \le \theta \le 2\pi$. Find $\cos\theta$ and $\tan\theta$.

(49) Evaluate $8.3 - \{10.3 + 4.3[7.4 + 2.3(6.3 - 8)]\}$.

(50) Simplify $\left(\dfrac{8x^8y^{-2}}{-4x^{-1}y^{-5}}\right)^{-3}$ as much as possible.

(51) Evaluate $4.9 - \dfrac{8.1/2.3^2 + 3.2 \cdot 4.3^5}{\sqrt{1.7 + 8.3 \cdot 4.7}}$.

(52) Evaluate $\sqrt{2.3 - \dfrac{(5.7 - 3.7 \cdot 8.2)^2}{(3.9 \cdot 5.4 - 6.1)^3}}$ as accurately as your calculator will allow.

(53) Simplify $\left(\dfrac{3x^7y^{-3}z^2}{x^4yz^4}\right)^2$ as much as possible, rewriting it without using any fractional or negative exponents.

(54) Factor $x^3 + 3x^2 - 34x - 120$ completely.

(55) Factor $x^2 + x + 1$ completely. *Note that you will need to use complex numbers to factor this. All complex numbers should ultimately be expressed in terms of i (with its usual meaning).*

(56) Factor $x^2 + 4x + 2$ completely.

(57) Simplify $\dfrac{x + 2/(x-1) - 4}{x - 3}$ as much as possible. About how big is it when x is close to 3? *Hint:* $5 + \frac{7}{3}$.

(58) An automobile cooling system contains five quarts of a mixture that is only 40% anti-freeze rather than the recommended 50% anti-freeze. How much water must be drained and replaced by pure anti-freeze to get the desired proportion of anti-freeze?

(59) Solve the inequality $\dfrac{x^2 + 2x - 15}{(x+1)^2} \geq 0$. *Hint: Factor.*

Simplify each of the following expressions as much as possible. In each case, each step you take should be clearly obvious. Do not cross anything out. The form of each answer should be in the form *original expression = ... = simplified expression.* If the original expression and the simplified expression are not equal at any specific points, so indicate. If a specific number is mentioned, figure out about how big the expression is when the variable is close to that number. You may use the following example as a guide.

Example: $\dfrac{x^3 + 4x^2 + x - 6}{x^2 - 6x + 5}$ when x is close to 1.

Answer: $\dfrac{x^3 + 4x^2 + x - 6}{x^2 - 6x + 5} = \dfrac{(x^2 + 5x + 6)(x-1)}{(x-5)(x-1)} = \dfrac{x^2 + 5x + 6}{x - 5} = \dfrac{(x+5)(x+1)}{x-5}$

if $x \neq 1$. This is approximately $-\frac{3}{2}$ when x is close to 1.

(60) $\dfrac{t^2 - 9}{t - 3}$, t close to 3.

(61) $\dfrac{x^2 + 2x - 8}{x^2 - 4x + 4}$, x close to 2.

(62) $\dfrac{1/r - 1/5}{r - 5}$, r close to 5.

(63) $\dfrac{x^2 + 6/x - 11}{x - 3}$, x close to 3.

(64) $\dfrac{\sqrt{t} - 11}{t - 121}$, t close to 121.

In this example, rationalize the numerator. Hint: $x^2 - y^2 = (x-y)(x+y)$.

(65) $\dfrac{\sqrt[3]{x} - 4}{x - 64}$, x close to 64.

In this example, rationalize the numerator. Hint: $x^3 - y^3 = (x - y)(x^2 + xy + y^2)$.

(66) A box with a volume of 1080 cubic inches is twice as long as it is wide, and three inches higher than its length. What are its dimensions?

(67) Solve the inequality $\dfrac{x^2 - 6x + 9}{x + 4} \leq 0$.

(68) If the volume of a cylinder is 126π cubic inches and the radius is 6 inches, then what is the height?

(69) A pharmacist needs to obtain a 70% alcohol solution. How many ounces of a 30% alcohol solution must be mixed with 40 ounces of an 80% alcohol solution to obtain a 70% alcohol solution?

(70) Complete the following definition: The graph of a function f is {

(71) Consider the function $f(x) = \begin{cases} 2 & \text{if } x < 3 \\ 2x & \text{if } x \geq 3 \end{cases}$.

(72) Give the coordinates of a point on its graph for which the first coordinate is 2.

(73) Give the coordinates of a point on its graph for which the second coordinate is 28.

(74) Give the coordinates of three other points on its graph.

(75) Sketch its graph.

(76) Consider a single elimination basketball tournament with eight teams.

(77) How many games will be played?

(78) How many different ways can the tournament chart come out, given the original seedings as shown?

(79) Consider an angle θ whose measurement, in radians, is 30. What is its measurement in degrees?

(80) Find $\sin(5\pi/3)$, $\cos(5\pi/3)$ and $\tan(5\pi/3)$.

(81) Use the formula $\cos(u-v) = \cos u \cos v + \sin u \sin v$ to obtain a formula for $\cos(u+v)$.

(82) Find $\sin(75°)$. *Hint: 45+30=75. Your answer to should be exact, not a calculator approximation, and the method you used to obtain it should be crystal clear.*

(83) Solve each equation or inequality. Make sure that you clearly show each solution set.

(84) $5x + 9 = -1$

(85) $5x + 9 > -1$

(86) Solve each equation or inequality. Make sure that you clearly show each solution set.

(87) $x^2 + 12 = 7x$

(88) $x^2 + 12 \leq 7x$

(89) Solve each equation or inequality. Make sure that you clearly show each solution set.

(90) $|5x - 10| = 20$

(91) $|5x - 10| \geq 20$

(92) Solve each equation or inequality. Make sure that you clearly show each solution set.

(93) $\dfrac{(x + 9)(x - 3)}{x - 5} = 0$

(94) $\dfrac{(x + 9)(x - 3)}{x - 5} > 0$

(95) Calculate the following.

(96) $(18 + 3i) - (5 - 7i)$

(97) $\dfrac{18+3i}{5-7i}$

(98) Consider the two points with coordinate representations $(-2,5)$ and $(3,-7)$.

(99) Draw coordinate axes and locate the two points in the coordinate plane.

(100) Find the distance between the two points.

(101) Joe Bellino purchased a new football along with assorted odds and ends at a local discount department store. All the items he purchased were subject to Connecticut's 6% sales tax. If his total bill was \$50.35, exactly how much of the bill was for the sales tax?

(102) Ron, a gardening specialist at our Waterbury Campus, is designing a spring display of tulips and daffodils. The interim director of the campus has requested a 6-ft by 8-ft area of tulips surrounded by a uniform border of daffodils. The total area of tulips and daffodils is to be 100 square feet. How wide should the border be?

(103) Solve each equation or inequality. Make sure that you clearly show each solution set.

(104) $9x+17=-1$

(105) $9x+17<-1$

(106) Solve each equation or inequality. Make sure that you clearly show each solution set.

(107) $x^2+4x=60$

(108) $x^2+4x\geq 60$

(109) Solve each equation or inequality. Make sure that you clearly show each solution set.

(110) $|3x-6|=12$

(111) $|3x-6|\leq 12$

(112) Solve each equation or inequality. Make sure that you clearly show each solution set.

(113) $\dfrac{(x-9)(x+3)}{x-5}=0$

(114) $\dfrac{(x-9)(x+3)}{x-5}<0$

(115) Calculate the following.

(116) $(5+3i)-(11-2i)$

(117) $\dfrac{5+3i}{11-2i}$

(118) Consider the two points with coordinate representations $(-2,12)$ and $(4,4)$.

(119) Draw coordinate axes and locate the two points in the coordinate plane.

(120) Find the distance between the two points.

(121) An experimental electric-solar car completed the 1000 mile Tour de Sol race in 35 hours. For the 600 miles travelled during daylight the car averaged 20 miles per gallon more than it did for the 400 miles travelled at night. What was the average speed of the car during the nighttime?

(122) If the perimeter of a rectangular flag is 34 inches and the diagonal is 13 inches, then what are the length and width?

(123) Simplify $\left(\dfrac{x^5y^3}{x^2y}\right)^8$ as much as possible.

(124) Solve the inequality $\dfrac{(x+5)(x-1)^2}{x-3}\leq 0$.

(125) Find a formula for f^{-1} if $f(x) = 8x + 15$.
(126) Suppose \$753 is placed in a bank account paying interest at an annual rate of 2.7%, compounded monthly. What will the balance be after fifty (50) years is the money is left undisturbed?
(127) Suppose \$753 is placed in a bank account paying interest at an annual rate of 2.7%, compounded continuously. How long will it take for the balance to double? *Express your answer in terms of years and days.*
(128) Suppose the population of a county in Connecticut is growing at an annual rate of 2.7%. How long will it take for the population to double?
(129) A radioactive substance has a half-life of 750 seconds. How long will it take for 95% of the substance to decay?
(130) Consider functions f and g defined by the following formulas. $f(x) = x^2 + e^x$, $g(x) = 5x - \ln(x)$.
(131) Obtain a formula for the function $f + g$.
(132) Obtain a formula for the function $f - g$.
(133) Obtain a formula for the function $g - f$.
(134) Obtain a formula for the function fg.
(135) Obtain a formula for the function f/g.
(136) Obtain a formula for the function g/f.
(137) Obtain a formula for the function $f \circ g$.
(138) Obtain a formula for the function $g \circ f$.
(139) Simplify $\dfrac{f(x+h) - f(x)}{h}$.
(140) Simplify $\dfrac{g(x+h) - g(x)}{h}$.
(141) Simplify $\left(\dfrac{x^6y^2}{x^3y^4}\right)^9$ as much as possible.
(142) Solve the inequality $\dfrac{(x-1)(x+5)^2}{x-4} \geq 0$.
(143) Find a formula for f^{-1} if $f(x) = 10x - 15$.
(144) Suppose \$574 is placed in a bank account paying interest at an annual rate of 2.9%, compounded quarterly. What will the balance be after fifty (50) years is the money is left undisturbed?
(145) Suppose \$574 is placed in a bank account paying interest at an annual rate of 2.9%, compounded continuously. How long will it take for the balance to double? *Express your answer in terms of years and days.*
(146) Suppose the population of a county in Connecticut is growing at an annual rate of 2.9%. How long will it take for the population to double?
(147) A radioactive substance has a half-life of 570 seconds. How long will it take for 93% of the substance to decay?
(148) Consider functions f and g defined by the following formulas. $f(x) = x^3 + \ln(x)$, $g(x) = 4x - e^x$.
(149) Obtain a formula for the function $f + g$.
(150) Obtain a formula for the function $f - g$.

(151) Obtain a formula for the function $g - f$.
(152) Obtain a formula for the function fg.
(153) Obtain a formula for the function f/g.
(154) Obtain a formula for the function g/f.
(155) Obtain a formula for the function $f \circ g$.
(156) Obtain a formula for the function $g \circ f$.
(157) Simplify $\dfrac{f(x+h) - f(x)}{h}$.
(158) Simplify $\dfrac{g(x+h) - g(x)}{h}$.
(159) Solve the inequality $x^2 + 12x < 64$.
(160) Solve the equation $|4x - 14| = 22$.
(161) Suppose \$1000 is left undisturbed in a bank account paying interest at an annual rate of 3.27%. What will the balance be after fifty years if (a) interest is compounded quarterly and (b) interest is compounded continuously?
(162) Solve the right triangle for which one angle is 40° and the hypotenuse is 20.
(163) Solve the isosceles triangle which has two angles of 35° each and for which the side opposite the other angle is 50.
(164) Verify the identity $\sec^2 x = \dfrac{\csc x}{\csc x - \sin x}$.
(165) Find $\sin\theta$, $\cos\theta$, $\tan\theta$, $\sec\theta$, $\csc\theta$ and $\cot\theta$ if $\theta = 11\pi/6$. *These values must be exact, not calculator approximations, and you must clearly show how they were obtained.*
(166) Find simple identities for $\sin(2\pi - x)$, $\cos(2\pi - x)$ and $\tan(2\pi - x)$, using either the definitions of the trigonometric functions and a unit circle or the graphs of the trigonometric functions. *Make sure that you clearly show how the identities were obtained.*
(167) Suppose $\sin\theta = .6$ and $\cos\theta < 0$. Find each of the following exactly.
(168) $\cos\theta$
(169) $\tan\theta$
(170) $\sin(-\theta)$
(171) $\cos(\theta + \pi/6)$
(172) Use your calculator to calculate $\dfrac{3.2^{2.1}\sin(.1) + 2\ln(4)}{8e^2 - 3\cos(.2)}$, including at least six digits after the decimal point. The calculation should be done without writing down and reentering any intermediate results.
(173) Solve the inequality $x^2 + 10x \geq 56$.
(174) Solve the equation $|4x - 18| = 22$.
(175) Suppose \$1000 is left undisturbed in a bank account paying interest at an annual rate of 3.27%. What will the balance be after sixty years if (a) interest is compounded monthly and (b) interest is compounded continuously?
(176) Solve the right triangle for which one angle is 35° and the hypotenuse is 20.
(177) Solve the isosceles triangle which has two angles of 40° each and for which the side opposite the other angle is 50.
(178) Verify the identity $\sec^2 x = \dfrac{\csc x}{\csc x - \sin x}$.

(179) Find $\sin\theta$, $\cos\theta$, $\tan\theta$, $\sec\theta$, $\csc\theta$ and $\cot\theta$ if $\theta = 7\pi/4$. *These values must be exact, not calculator approximations, and you must clearly show how they were obtained.*

(180) Find simple identities for $\sin(\pi - x)$, $\cos(\pi - x)$ and $\tan(\pi - x)$, using either the definitions of the trigonometric functions and a unit circle or the graphs of the trigonometric functions. *Make sure that you clearly show how the identities were obtained.*

(181) Suppose $\sin\theta = .8$ and $\cos\theta < 0$. Find each of the following exactly.

(182) $\cos\theta$

(183) $\tan\theta$

(184) $\sin(-\theta)$

(185) $\cos(\theta + \pi/6)$

(186) Use your calculator to calculate $\dfrac{3.1^{2.4}\sin(.1) + 2\ln(5)}{8e^3 - 4\cos(.2)}$, including at least six digits after the decimal point. The calculation should be done without writing down and reentering any intermediate results. Indicate your calculator make and model and the sequence of keypresses you used below.

(187) Find the solution set for the equation $|x + 3| = 8$.

(188) Find the solution set for the equation $|x - 6| = 16$.

(189) Consider the complex numbers $x = 5 - 7i$ and $y = 4 + 3i$. Calculate each of the following and put each in a relatively simple form.

(190) $x + y$

(191) $x - y$

(192) $x \cdot y$

(193) x/y

(194) Solve the quadratic inequality $x^2 + 18 > 9x$. *Make sure that your answer is clear.*

(195) Use your calculator to calculate $\dfrac{3.2^2 + 5\sqrt{4.32}}{6.1 + (2.7)(8.1^3)}$, including at least six digits after the decimal point. The calculation should be done without writing down and reentering any intermediate results. Indicate your calculator make and model and the sequence of keypresses you used below.

(196) Solve the inequality $\dfrac{(x-8)(x+9)}{x-5} \geq 0$.

(197) Solve the inequality $\dfrac{x-5}{(x-13)(x+10)} \leq 0$. *Make sure that your answer is clear.*

(198) Let $f(x) = \dfrac{x^2 + 5x - 3}{4x + 7}$. Slightly simplify each of the following.

(199) $f(5) =$

(200) $f(t) =$

(201) $f(w + h) =$

(202) $f(x + h) =$

(203) Simplify and rewrite without using either fractional or negative exponents: $\dfrac{\dfrac{\sqrt{27}x^2y}{3z^2}}{\dfrac{5xy^2}{3^{\frac{1}{2}} \cdot z}}$

(204) Multiply out and collect like terms: $(5x^2 - 3x + 2)(4x + 7)$
(205) Compute the quotient: $(2x^3 + 7x^2 - 9) \div (2x + 3)$
(206) Factor completely: $2x^2 + 5x - 12$
(207) Factor completely: $x^3 + x^2 - 14x - 24$
(208) Find the solution set of the equation $8x + 12 = 5x + 30$
(209) Find the solution set of the equation $x^2 + 3x = 18$
(210) Find the solution set of the equation $x^3 + x^2 = 2(7x + 12)$
(211) Mary is a year older than her spouse. In five years, their combined ages (measured in years) will total 53.
(212) Translate the English language statement "Mary is a year older than her spouse" into a mathematical language statement. *In other words, into an equation.*
(213) Translate the English statement "In five years, their combined ages will total 53" into a mathematical language statement.
(214) John and Mary had a fight planning their wedding, and Mary sped off in a huff, driving 52 miles per hour in her old car. John, after brooding for an hour, realized his foolish mistake and, knowing exactly where she's going, sped after her, driving 65 miles per hour in his sports car. How far away from home were they when he finally caught up to her?
(215) Simplify and rewrite without using either fractional or negative exponents: $\dfrac{\dfrac{\sqrt{125}xy^3}{3z}}{\dfrac{3x^2y^2}{5^{\frac{1}{2}} \cdot z^2}}$
(216) Multiply out and collect like terms: $(3x^2 - 4x + 2)(4x + 7)$
(217) Compute the quotient: $(2x^3 - x^2 + 2x + 12) \div (2x + 3)$
(218) Factor completely: $3x^2 - 9x - 12$
(219) Factor completely: $x^3 + x^2 - 30x - 72$
(220) Find the solution set of the equation $7x + 12 = 11x - 8$
(221) Find the solution set of the equation $x^2 + 3x = 28$
(222) Find the solution set of the equation $x^3 + x^2 = 2(15x + 36)$
(223) Mary keeps both a savings account and a checking account. She keeps \$500 more in her savings account than she keeps in her checking account, and if she put in another \$300 she'd have a total of \$2000 in those accounts.
(224) Translate the English language statement "She keeps \$500 more in her savings account than she keeps in her checking account" into a mathematical language statement. *In other words, into an equation.*
(225) Translate the English statement "if she put in another \$300 she'd have a total of \$2000 in those accounts" into a mathematical language statement.
(226) Thelma and Louise dash out after robbing a bank in Desert Gulch, hop into their getaway car and take off at its top speed of 60 miles per hour. By the time the police can take off after them, fifteen minutes have gone by so the police call their comrades in town Thelma and Louise seem to be heading to, Oasis, 50 miles away. The Desert Gulch police come after Thelma and Louise, while the Oasis police come towards

them from the opposite direction. Both police cars are travelling at their top speed of 80 miles per hour.

Who catches Thelma and Louise first, and where? *All this action theoretically takes place in the midwest, where Professor McGavran grew up, the roads are all straight and there are no turn-offs.*

(227) Find the solution set of the equation $x^3 + 3x^2 = 28x + 60$.
(228) Find the solution set of the inequality $5x - 13 \leq 12x + 9$.
(229) Find the solution set of the inequality $20x + 96 > x^3 + 7x^2$.
(230) Define what is meant by (a) a function f and (b) the graph of a function f.
(231) Sketch the graph of the equation $x^2 + 8x + y^2 = 6y$. Make sure that everything important is clearly labelled.
(232) Sketch the graph of the equation $x^2 = 3(2x + y + 2)$. Make sure that everything important is clearly labelled.
(233) Sketch the graph of the equation $x^2 + 8 = 2(3x + 2y^2)$. Make sure that everything important is clearly labelled.
(234) Brent lent his brother Bob some money at 8% simple interest, and he lent his sister Betty half as much money at twice the interest rate. If Brent made a grand total of 24 cents in interest, then how much did he lend to each sibling?
(235) Find the solution set of the equation $20x + 96 = x^3 + 7x^2$.
(236) Find the solution set of the inequality $13x - 5 > 9x + 12$.
(237) Find the solution set of the inequality $x^3 + 3x^2 \leq 28x + 60$.
(238) Define what is meant by (a) a function f and (b) the graph of a function f.
(239) Sketch the graph of the equation $x^2 + y^2 + 8y = 6x$. Make sure that everything important is clearly labelled.
(240) Sketch the graph of the equation $x^2 = 3(2x + y + 2)$. Make sure that everything important is clearly labelled.
(241) Sketch the graph of the equation $x^2 + 26 = 2(6x + y)$. Make sure that everything important is clearly labelled.
(242) A pharmacist needs to obtain a 70% alcohol solution. How many ounces of a 30% solution must be mixed with 40 ounces of an 80% solution to obtain a 70% alcohol solution?
(243) Convert the radian measure to degrees: $13\pi/8$.
(244) Convert the degree measure to radians: 70 deg.
(245) For each of the following angles t, find $\sin t$, $\cos t$ and $\tan t$.
(246) $t = 5\pi/3$
(247) $t = 3\pi/4$.
(248) A right triangle contains a leg of length 8 opposite an angle of 23 deg. Find the other acute angle and the lengths of the other leg and the hypotenuse. *The numerical answers may be approximations.*
(249) A triangle contains a side of length 8 opposite an angle of 53 deg. If one of the other angles is 80 deg, find the size of the third angle along with the lengths of the other sides. *The numerical answers may be approximations.*

(250) For each of the following expressions, write them as simply as possible in terms of $\sin t$, $\cos t$, $\tan t$, $\csc t$, $\sec t$ and/or $\cot t$. In each case, explain in plain language how you obtained the identity.
(251) $\cos(-t)$
(252) $\sin(\frac{\pi}{2} - t)$
(253) $\sin(\pi - t)$
(254) $\tan(t + \pi)$
(255) Sketch the graph of the function $y = \sin x$ for $-4\pi \leq x \leq 4\pi$. Be sure to appropriately label the axes.
(256) Complete the following definition: $\arcsin x$ is ....
(257) Find the following.
(258) $\arcsin(-1/2)$
(259) $\sin(\arcsin(.2))$
(260) $\cos(\arcsin(-.2))$
(261) $\arcsin(\sin(9\pi/8))$
(262) A pendulum on a grandfather clock swings back an forth making a maximum angle of 5 deg with the vertical. If the pendulum in 10 inches long, what is the length of the arc it sweeps out as it swings back and forth once?
(263) A five foot six inch UConn/Waterbury student casts a shadow ten feet long. What is the angle of elevation of the sun? *Express the angle exactly and then obtain a decimal approximation in either radians or degrees.*
(264) Convert the radian measure to degrees: $15\pi/8$.
(265) Convert the degree measure to radians: 65 deg.
(266) For each of the following angles t, find $\sin t$, $\cos t$ and $\tan t$.
(267) $t = 4\pi/3$
(268) $t = 5\pi/4$.
(269) A right triangle contains a leg of length 12 adjacent to an angle of 27 deg. Find the other acute angle and the lengths of the other leg and the hypotenuse. *The numerical answers may be approximations.*
(270) A triangle contains a side of length 12 opposite an angle of 65 deg. If one of the other angles is 80 deg, find the size of the third angle along with the lengths of the other sides. *The numerical answers may be approximations.*
(271) For each of the following expressions, write them as simply as possible in terms of $\sin t$, $\cos t$, $\tan t$, $\csc t$, $\sec t$ and/or $\cot t$. In each case, explain in plain language how you obtained the identity.
(272) $\sin(-t)$
(273) $\cos(\frac{\pi}{2} - t)$
(274) $\tan(\pi - t)$
(275) $\cos(t + \pi)$
(276) Sketch the graph of the function $y = \cos x$ for $-4\pi \leq x \leq 4\pi$. Be sure to appropriately label the axes.
(277) Complete the following definition: $\arctan x$ is ....
(278) Find the following.
(279) $\arccos(-1/2)$

(280) $\cos(\arccos(.2))$
(281) $\cos(\arcsin(-.2))$
(282) $\arcsin(\sin(11\pi/8))$
(283) A pendulum on a grandfather clock swings back an forth making a maximum angle of 4 deg with the vertical. If the pendulum in 10 inches long, what is the length of the arc it sweeps out as it swings back and forth once?
(284) At 4:30pm, when the angle of elevation of the sun is 13 deg, a repair truck casts a shadow 50 feet long. How high is the truck? *The numerical answer may be an approximation.*
(285) For each of the following angles t, find $\sin t$, $\cos t$, $\tan t$, $\sec t$, $\csc t$ and $\cot t$.
(286) $t = 4\pi/3$
(287) $t = 7\pi/4$
(288) $t = 5\pi/6$
(289) A right triangle contains a leg of length 11 adjacent to an angle of 37 deg. Find the other acute angle and the lengths of the other leg and the hypotenuse. *The numerical answers may be approximations.*
(290) A triangle contains a side of length 17 opposite an angle of 64 deg. If one of the other angles is 72 deg, find the size of the third angle along with the lengths of the other sides. *The numerical answers may be approximations.*
(291) For each of the following values of θ, write each of $\sin\theta$, $\cos\theta$ and $\tan\theta$ as simply as possible in terms of $\sin t$, $\cos t$, $\tan t$, $\csc t$, $\sec t$ and/or $\cot t$. In each case, explain in plain language how you obtained the identity unless you are certain that the pictures you drew made your reasoning absolutely perfectly clear.
(292) $\theta = -t$
(293) $\theta = \dfrac{\pi}{2} - t$
(294) $\theta = \pi - t$
(295) $\theta = t + \pi$
(296) $\theta = t + 2\pi$
(297) $\theta = 2\pi - t$
(298) Find the following.
(299) $\arcsin(-\sqrt{3}/2)$
(300) $\sin(\arcsin(.7))$
(301) $\cos(\arcsin(-.7))$
(302) $\arcsin(\sin(2\pi/3))$
(303) $\arccos(\sin(-\pi/5))$
(304) A six foot five inch UConn/Waterbury student, a forward on its basketball team, casts a shadow ten feet long. What is the angle of elevation of the sun? *Express the angle exactly and then obtain a decimal approximation in either radians or degrees.*
(305) Two hours after sunrise, when the angle of elevation of the sun is 17 deg, the shadow of a tennis ball falls 45 feet from a point on the ground directly below the ball. How high is the tennis ball off the ground at that instant? *The numerical answer may be an approximation.*
(306) Simplify the following expressions as much as possible.

(307) $$\frac{\frac{x^2-x-6}{x+2}+4}{\frac{x+1}{5}}$$

(308) $(\csc x + \cot x)(1 - \cos x)$

(309)

(310) Multiply $(3x^2 - 5\cos x + 2)(x - 3\tan x)$ and simplify as much as possible.

(311) Factor $x^3 + 6x^2 - 9x - 54$ as much as possible.

(312) Consider the function $f(x) = \dfrac{x^2 - 2x - 8}{x - 8}$.

(313) Find the solution set of the equation $f(x) = 0$.

(314) Find the solution set of the inequality $f(x) \leq 0$.

(315) Sketch the graphs of the following equations.

(316) $y = 3\sin(x - \pi/2)$

(317) $x^2 + 4x + y^2 = 9y + 12$

(318) Find $\sin\theta$, $\cos\theta$ and $\tan\theta$ for each of the following values of θ.

(319) $\theta = 3\pi/2$

(320) $\theta = 5\pi/6$

(321) $\theta = 5\pi/4$

(322) Write each of the following as simply as possible in terms of the functions $\sin x$, $\cos x$ and $\tan x$.

(323) $\sin(3\pi/2 - x)$

(324) $\cos(\pi - x)$

(325) Calculate each of the following.

(326) $\arcsin(cos(8\pi/9))$

(327) $\sin(\arccos(.1))$

(328) $\cos(5\pi/12)$ *Hint:* $1/4 + 1/6 = 5/12$.

(329) Verify the identity $\dfrac{1}{\sec x - \tan x} = \dfrac{1 + \sin x}{\cos x}$.

(330) Consider a triangle with angles of 40 deg and 70 deg and an included side of length 10. Find the lengths of the other two sides. *Approximate the lengths to within 0.01 of their actual values.*

(331) Kermit has just received an inheritance of \$15,000. Of that, \$5,000 was already invested in a funding paying interest at an effective annual yield of 5%, while another \$4,000 was invested in an instrument effectively yielding 7% annually. What must the effective yield of the remaining funds be in order that the effective annual yield of the entire \$15,000 be at least 7%? *Approximate the actual yield needed to within .01%.*

(332) x^2x^5

(333) $\dfrac{x^2}{x^5}$

(334) $(x^2)^5$

(335) $(xy)^5$

(336) $\left(\dfrac{x}{y}\right)^5$

(337) Rewrite without using radicals: $\sqrt[3]{t^2}$

(338) Rewrite without using radicals: $\dfrac{1}{\sqrt[5]{x^2}}$

(339) Rewrite without using fractional exponents: $(8x^4)^{3/2}$

(340) $(-x)^2$

(341) Solve for y: $7y + 9 = 2y + 3$

(342) x^4x^5

(343) $\dfrac{x^4}{x^5}$

(344) $(x^4)^5$

(345) $(xy)^4$

(346) $\left(\dfrac{x}{y}\right)^4$

(347) Rewrite without using radicals: $\sqrt[5]{t^3}$

(348) Rewrite without using radicals: $\dfrac{2}{\sqrt[6]{x^2}}$

(349) Rewrite without using fractional exponents: $(8x^6)^{3/4}$

(350) $(-x)^2$

(351) Solve for z: $3z - 9 = 8z + 56$

(352) Simplify as much as possible: $\dfrac{\left(y^3\sqrt{2x}\right)^2}{6xy} \cdot \dfrac{3y^{-2}}{y^3}$

(353) Perform the indicated multiplication and write the product as simply as possible: $(x + 4) \cdot (\sqrt{x} - 4/\sqrt{x})$

(354) Perform the indicated multiplication and write the product as simply as possible: $(x^2 - 5x - 3) \cdot (2x - 7)$

(355) Factor completely: $x^3 + x^2 - 22x - 40$

(356) Simplify as much as possible: $\dfrac{\left(x^3\sqrt{2y}\right)^4}{\left(6x^2y\right)^3} \cdot \dfrac{3y^{-2}}{\left(x^3y^{-3/2}\right)^2}$

(357) Perform the indicated multiplication and write the product as simply as possible: $(2t + 3) \cdot (2 - 3/t)$

(358) Perform the indicated multiplication and write the product as simply as possible: $(x^2 - 7x - 4) \cdot (3x - 5)$

(359) Factor completely: $x^3 + 3x^2 - 18x - 40$

(360) Find the solution set for the inequality $x^2 + x \geq 30$.

(361) Find the solution set for the inequality $\dfrac{(x - 2)(x + 7)}{x - 5} < 0$.

(362) Find the solution set for the inequality $x^2 + 6 < 5x$.

(363) Find the solution set for the inequality $\dfrac{(x - 3)(x + 5)}{x - 8} \geq 0$.

(364) Find the solution set for the inequality $x^2 + 5x < 24$.

(365) Find the solution set for the inequality $\dfrac{(x-8)(x+4)}{x-7} \geq 0$.

(366) Find the solution set for the inequality $x^2 + 10 > 7x$.

(367) Find the solution set for the inequality $\dfrac{(x+12)(x-5)}{x-9} \leq 0$.

(368) Consider the function $f(x) = x^2 - 3x - 28$.

(369) Find $f(-2)$ and $f(0)$.

(370) Find two different values of x for which $f(x) = 0$.

(371) Use your answers above to plot *exactly* four points on the graph of the function f. Clearly label each of the points with its coordinates.

(372) Find the distance between $(-2, f(-2))$ and $(0, f(0))$.

(373) Find the lengths of all the sides of the given right triangle, given that $\sin\alpha = 0.3$.
Hint: $\cos^2\alpha + \sin^2\alpha = 1$.

(374) Find the lengths of all the sides of the given right triangle, given that $\cos\alpha = 0.4$.
Hint: $\cos^2\alpha + \sin^2\alpha = 1$.

(375) Simplify the algebraic expression $\dfrac{35x^2y^5}{5x^3y\sqrt{x}}$, rewriting it without the use of radicals or negative exponents.

(376) Calculate and simplify the following.

(377) $(x^3 + 3x^2 - 10x - 24) - (x + 2)$

(378) $(x^3 + 3x^2 - 10x - 24) \cdot (x + 2)$

(379) $\dfrac{x^3 + 3x^2 - 10x - 24}{x + 2}$

(380) A new homeowner purchased a home at a purchase price of \$140,000. In addition to the price price, the buyer had to pay various fees and taxes totaling \$1,700 along with a fee to his lawyer amounting to 0.8% of the purchase price. What was the total cost to the buyer?

(381) The total cost of a new VCR, including a 6% sales tax, was \$207.23. What was the sales price?

(382) Rewrite each of the following complex numbers in the form $a + bi$, where a and b are real numbers.

(383) $(5 + 8i) + (7 - 3i)$

(384) $(5 + 8i) - (7 - 3i)$

(385) $(5 + 8i) \cdot (7 - 3i)$

(386) $\dfrac{5 + 8i}{7 - 3i}$

(387)

(388) Factor the polynomial $x^2 + 2x - 15$.

(389) Solve the quadratic equation $x^2 + 2x = 15$ using the method of factoring.

(390) Solve the quadratic equation $x^2 + 2x = 15$ using the quadratic formula.

(391) Solve the quadratic equation $x^2 + 2x = 15$ using the method of completing the square.

(392) Solve the quadratic inequality $x^2 + 2x < 15$.

(393) Solve the quadratic inequality $x^2 + 2x \geq 15$.

(394) Factor the polynomial $x^3 + 3x^2 - 13x - 15$.

(395) Solve the polynomial equation $x^3 + 3x^2 = 13x + 15$.
(396) Solve the inequality $x^3 + 3x^2 \leq 13x + 15$.
(397) The degree measure of an angle is $27°$. Find its radian measure.
(398) The radian measure of an angle is 27. Find its degree measure.
(399) Find the sin, cos and tan exactly for each of the following angles without the use of a calculator. For each, draw a unit circle, draw the appropriate triangle (if any), show all your calculations and label the appropriate coordinates.
(400) $5\pi/3$
(401) $5\pi/6$
(402) $7\pi/4$
(403) $3\pi/2$
(404) Sketch the graphs of the sin, cos and tan functions on the interval $[-4\pi, 4\pi]$.
(405) Suppose $\sin(x) = 0.3$. Find each of the following.
(406) $\sin(x + \pi)$
(407) $\sin(\pi - x)$
(408) $\cos(\pi/2 - x)$
(409) $\sin(x + 2\pi)$
(410) Find each of the following.
(411) $\sin(\arcsin(-.4))$
(412) $\cos(\arcsin(-.4))$
(413) $\tan(\arcsin(-.4))$
(414) $\arcsin(\sin(2))$
(415) Suppose $\cos(\theta) = .7$ and $-\pi \leq \theta \leq 0$. Find $\sin(\theta)$.
(416) Consider a right triangle where one acute angle is 1.2 and the hypotenuse is 12. Find the other angle and the lengths of the legs.
(417) Suppose a telephone pole casts a shadow 50 feet long when the angle of elevation of the sun is $42°$. How tall is the pole?
(418)
(419) Factor the polynomial $x^2 + 12x - 45$.
(420) Solve the equation $x^2 + 12x = 45$ three different ways, once each by factoring, by completing the square, and by using the Quadratic Formula.
(421) Solve the inequality $x^2 + 12x < 45$.
(422) Factor the polynomial $x^3 - 3x^2 + 4$.
(423) Solve the equation $x^3 + 4 = 3x^2$.
(424) Solve the inequality $x^3 + 4 \geq 3x^2$.
(425) Solve the equation $|x - 14| = 5$.
(426) Solve the inequality $|x - 14| > 5$.
(427) Solve the equation $|x - 14| \leq 5$.
(428) Suppose \$500 is left undisturbed in a bank account paying interest at an annual rate of 3.27%. What will the balance be after five years if interest is compounded monthly?
(429) Solve the right triangle for which one angle is $35°$ and the hypotenuse is 14.
(430) Solve the isosceles triangle which has two angles of $32°$ each and for which the side opposite the other angle is 43.

(431) Verify the identity $\dfrac{1}{\sec\theta - \tan\theta} = \dfrac{1+\sin\theta}{\cos\theta}$.

(432) Find $\sin\theta$, $\cos\theta$, $\tan\theta$, $\sec\theta$, $\csc\theta$ and $\cot\theta$ if $\theta = 10\pi/3$. *These values must be exact, not calculator approximations, and you must clearly show how they were obtained.*

(433) Find simple identities for $\sin(2\pi - x)$, $\cos(2\pi - x)$ and $\tan(2\pi - x)$. You may use the definitions of the trigonometric functions involving a unit circle, the graphs of the trigonometric functions, or the sum and difference formulae, but *make sure that you clearly show how the identities were obtained.*

(434) Suppose $\sin\theta = -.3$ and $\cos\theta > 0$. Find each of the following exactly.

(435) $\cos\theta$

(436) $\tan\theta$

(437) $\sin(-\theta)$

(438) $\cos(\theta + \pi/6)$

(439) $\cos(2\theta)$

(440) Simplify the following expression, rewriting it without the use of radicals or negative exponents.

$$\frac{(x^2\sqrt{y})(5x^{-6}y^3)}{\sqrt[3]{8y}}.$$

(441) Simplify the algebraic expression $\dfrac{30x^2}{5x^6\sqrt[3]{x}}$, rewriting it without the use of radicals or negative exponents.

(442) 6% sales tax and a \$12.00 departure tax are added to the base price of an airline ticket from Bradley Airport to Miami Beach. If the total cost of the ticket is \$143.50, what is the base price?

(443) Simplify the algebraic expression $\dfrac{25x\sqrt{x}}{10x^{4/3}}$, rewriting it without the use of radicals or negative exponents.

(444) Write each of the following complex numbers in the form $a + bi$, where a and b are real numbers and $i = \sqrt{-1}$, i.e. $i^2 = -1$.

(445) $(5 + 3i) - (2 - 7i)$

(446) $(5 + 3i) \cdot (2 - 7i)$

(447) $\dfrac{5+3i}{2-7i}$

(448) Solve the inequality $|2x - 10| \leq 3$.

(449) Solve the inequality $\dfrac{x+3}{x-5} \geq 0$.

(450) Consider a right triangle with an acute angle $\theta = 0.5$ and hypotenuse of length 10. Find the lengths of the two legs.

(451) Consider the angle pictured above. Find each of the following.

(452) $\cos\theta$

(453) $\sin\theta$

(454) $\tan\theta$

(455) $\sec\theta$

(456) $\csc\theta$
(457) $\cot\theta$
(458) Complete the following identities as simply as possible.
(459) $\sin(x+\frac{\pi}{2}) =$
(460) $\cos(-x) =$
(461) Suppose $\sin(x) = .3$ and $\cos(x) < 0$. Find $\cos(x)$.
(462) Verify the identity $\sec x + \tan x = \dfrac{\cos x}{1-\sin x}$.
(463) Use the identities $\sin(u+v) = \sin u\cos v + \cos u\sin v$ and $\cos(u+v) = \cos u\cos v - \sin u\sin v$ to derive the identity $\tan(u+v) = \dfrac{\tan u + \tan v}{1-\tan u\tan v}$.
(464) Solve each equation or inequality. Make sure that you clearly show each solution set.
(465) $5x + 9 = -1$
(466) $5x + 9 > -1$
(467) Solve each equation or inequality. Make sure that you clearly show each solution set.
(468) $x^2 + 12 = 7x$
(469) $x^2 + 12 \leq 7x$
(470) Solve each equation or inequality. Make sure that you clearly show each solution set.
(471) $|5x - 10| = 20$
(472) $|5x - 10| \geq 20$
(473) Solve each equation or inequality. Make sure that you clearly show each solution set.
(474) $\dfrac{(x+9)(x-3)}{x-5} = 0$
(475) $\dfrac{(x+9)(x-3)}{x-5} > 0$
(476) Calculate the following.
(477) $(18+3i) - (5-7i)$
(478) $\dfrac{18+3i}{5-7i}$
(479) Consider the two points with coordinate representations $(-2, 5)$ and $(3, -7)$.
(480) Draw coordinate axes and locate the two points in the coordinate plane.
(481) Find the distance between the two points.
(482) Joe Bellino purchased a new football along with assorted odds and ends at a local discount department store. All the items he purchased were subject to Connecticut's 6% sales tax. If his total bill was \$50.35, exactly how much of the bill was for the sales tax?
(483) Ron, a gardening specialist at our Waterbury Campus, is designing a spring display of tulips and daffodils. The interim director of the campus has requested a 6-ft by 8-ft area of tulips surrounded by a uniform border of daffodils. The total area of tulips and daffodils is to be 100 square feet. How wide should the border be?
(484) Solve each equation or inequality. Make sure that you clearly show each solution set.
(485) $9x + 17 = -1$
(486) $9x + 17 < -1$
(487) Solve each equation or inequality. Make sure that you clearly show each solution set.
(488) $x^2 + 4x = 60$

(489) $x^2 + 4x \geq 60$

(490) Solve each equation or inequality. Make sure that you clearly show each solution set.

(491) $|3x - 6| = 12$

(492) $|3x - 6| \leq 12$

(493) Solve each equation or inequality. Make sure that you clearly show each solution set.

(494) $\dfrac{(x-9)(x+3)}{x-5} = 0$

(495) $\dfrac{(x-9)(x+3)}{x-5} < 0$

(496) Calculate the following.

(497) $(5 + 3i) - (11 - 2i)$

(498) $\dfrac{5+3i}{11-2i}$

(499) Consider the two points with coordinate representations $(-2, 12)$ and $(4, 4)$.

(500) Draw coordinate axes and locate the two points in the coordinate plane.

(501) Find the distance between the two points.

(502) An experimental electric-solar car completed the 1000 mile Tour de Sol race in 35 hours. For the 600 miles travelled during daylight the car averaged 20 miles per gallon more than it did for the 400 miles travelled at night. What was the average speed of the car during the nighttime?

(503) If the perimeter of a rectangular flag is 34 inches and the diagonal is 13 inches, then what are the length and width?

(504) Simplify $\left(\dfrac{x^5y^3}{x^2y}\right)^8$ as much as possible.

(505) Solve the inequality $\dfrac{(x+5)(x-1)^2}{x-3} \leq 0$.

(506) Find a formula for f^{-1} if $f(x) = 8x + 15$.

(507) Suppose \$753 is placed in a bank account paying interest at an annual rate of 2.7%, compounded monthly. What will the balance be after fifty (50) years is the money is left undisturbed?

(508) Suppose \$753 is placed in a bank account paying interest at an annual rate of 2.7%, compounded continuously. How long will it take for the balance to double? *Express your answer in terms of years and days.*

(509) Suppose the population of a county in Connecticut is growing at an annual rate of 2.7%. How long will it take for the population to double?

(510) A radioactive substance has a half-life of 750 seconds. How long will it take for 95% of the substance to decay?

(511) Consider functions f and g defined by the following formulas. $f(x) = x^2 + e^x$, $g(x) = 5x - \ln(x)$.

(512) Obtain a formula for the function $f + g$.

(513) Obtain a formula for the function $f - g$.

(514) Obtain a formula for the function $g - f$.

(515) Obtain a formula for the function fg.

(516) Obtain a formula for the function f/g.

(517) Obtain a formula for the function g/f.
(518) Obtain a formula for the function $f \circ g$.
(519) Obtain a formula for the function $g \circ f$.
(520) Simplify $\dfrac{f(x+h)-f(x)}{h}$.
(521) Simplify $\dfrac{g(x+h)-g(x)}{h}$.
(522) Simplify $\left(\dfrac{x^6y^2}{x^3y^4}\right)^9$ as much as possible.
(523) Solve the inequality $\dfrac{(x-1)(x+5)^2}{x-4} \geq 0$.
(524) Find a formula for f^{-1} if $f(x) = 10x - 15$.
(525) Suppose \$574 is placed in a bank account paying interest at an annual rate of 2.9%, compounded quarterly. What will the balance be after fifty (50) years is the money is left undisturbed?
(526) Suppose \$574 is placed in a bank account paying interest at an annual rate of 2.9%, compounded continuously. How long will it take for the balance to double? *Express your answer in terms of years and days.*
(527) Suppose the population of a county in Connecticut is growing at an annual rate of 2.9%. How long will it take for the population to double?
(528) A radioactive substance has a half-life of 570 seconds. How long will it take for 93% of the substance to decay?
(529) Consider functions f and g defined by the following formulas. $f(x) = x^3 + \ln(x)$, $g(x) = 4x - e^x$.
(530) Obtain a formula for the function $f + g$.
(531) Obtain a formula for the function $f - g$.
(532) Obtain a formula for the function $g - f$.
(533) Obtain a formula for the function fg.
(534) Obtain a formula for the function f/g.
(535) Obtain a formula for the function g/f.
(536) Obtain a formula for the function $f \circ g$.
(537) Obtain a formula for the function $g \circ f$.
(538) Simplify $\dfrac{f(x+h)-f(x)}{h}$.
(539) Simplify $\dfrac{g(x+h)-g(x)}{h}$.
(540) Solve the inequality $x^2 + 12x < 64$.
(541) Solve the equation $|4x - 14| = 22$.
(542) Suppose \$1000 is left undisturbed in a bank account paying interest at an annual rate of 3.27%. What will the balance be after fifty years if (a) interest is compounded quarterly and (b) interest is compounded continuously?
(543) Solve the right triangle for which one angle is 40° and the hypotenuse is 20.
(544) Solve the isosceles triangle which has two angles of 35° each and for which the side opposite the other angle is 50.

(545) Verify the identity $\sec^2 x = \dfrac{\csc x}{\csc x - \sin x}$.

(546) Find $\sin\theta$, $\cos\theta$, $\tan\theta$, $\sec\theta$, $\csc\theta$ and $\cot\theta$ if $\theta = 11\pi/6$. *These values must be exact, not calculator approximations, and you must clearly show how they were obtained.*

(547) Find simple identities for $\sin(2\pi - x)$, $\cos(2\pi - x)$ and $\tan(2\pi - x)$, using either the definitions of the trigonometric functions and a unit circle or the graphs of the trigonometric functions. *Make sure that you clearly show how the identities were obtained.*

(548) Suppose $\sin\theta = .6$ and $\cos\theta < 0$. Find each of the following exactly.

(549) $\cos\theta$

(550) $\tan\theta$

(551) $\sin(-\theta)$

(552) $\cos(\theta + \pi/6)$

(553) Use your calculator to calculate $\dfrac{3.2^{2.1}\sin(.1) + 2\ln(4)}{8e^2 - 3\cos(.2)}$, including at least six digits after the decimal point. The calculation should be done without writing down and reentering any intermediate results. Indicate your calculator make and model and the sequence of keypresses you used below.

(554) Solve the inequality $x^2 + 10x \geq 56$.

(555) Solve the equation $|4x - 18| = 22$.

(556) Suppose \$1000 is left undisturbed in a bank account paying interest at an annual rate of 3.27%. What will the balance be after sixty years if (a) interest is compounded monthly and (b) interest is compounded continuously?

(557) Solve the right triangle for which one angle is 35° and the hypotenuse is 20.

(558) Solve the isosceles triangle which has two angles of 40° each and for which the side opposite the other angle is 50.

(559) Verify the identity $\sec^2 x = \dfrac{\csc x}{\csc x - \sin x}$.

(560) Find $\sin\theta$, $\cos\theta$, $\tan\theta$, $\sec\theta$, $\csc\theta$ and $\cot\theta$ if $\theta = 7\pi/4$. *These values must be exact, not calculator approximations, and you must clearly show how they were obtained.*

(561) Find simple identities for $\sin(\pi - x)$, $\cos(\pi - x)$ and $\tan(\pi - x)$, using either the definitions of the trigonometric functions and a unit circle or the graphs of the trigonometric functions. *Make sure that you clearly show how the identities were obtained.*

(562) Suppose $\sin\theta = .8$ and $\cos\theta < 0$. Find each of the following exactly.

(563) $\cos\theta$

(564) $\tan\theta$

(565) $\sin(-\theta)$

(566) $\cos(\theta + \pi/6)$

(567) Use your calculator to calculate $\dfrac{3.1^{2.4}\sin(.1) + 2\ln(5)}{8e^3 - 4\cos(.2)}$, including at least six digits after the decimal point. The calculation should be done without writing down and reentering any intermediate results. Indicate your calculator make and model and the sequence of keypresses you used below.

(568) Find the solution set for the equation $|x - 6| = 16$.

(569) Consider the complex numbers $x = 5 - 7i$ and $y = 4 + 3i$. Calculate each of the following and put each in a relatively simple form.

(570) $x + y$

(571) $x - y$

(572) $x \cdot y$

(573) x/y

(574) Solve the quadratic equation $x^2 = 4x + 60$ *two* different ways.

(575) Solve the quadratic inequality $x^2 + 18 > 9x$. *Make sure that your answer is clear.*

(576) Use your calculator to calculate $\dfrac{3.2^2 + 5\sqrt{4.32}}{6.1 + (2.7)(8.1^3)}$, including at least six digits after the decimal point. The calculation should be done without writing down and reentering any intermediate results. Indicate your calculator make and model and the sequence of keypresses you used below.

(577) Solve the inequality $\dfrac{(x-8)(x+9)}{x-5} \geq 0$.

(578) Solve the inequality $\dfrac{x-5}{(x-13)(x+10)} \leq 0$. *Make sure that your answer is clear.*

(579) Let $f(x) = \dfrac{x^2 + 5x - 3}{4x + 7}$. Slightly simplify each of the following.

(580) $f(5) =$

(581) $f(t) =$

(582) $f(w + h) =$

(583) $f(x + h) =$

(584) Simplify and rewrite without using either fractional or negative exponents: $\dfrac{\dfrac{\sqrt{27}x^2y}{3z^2}}{\dfrac{5xy^2}{3^{\frac{1}{2}} \cdot z}}$

(585) Multiply out and collect like terms: $(5x^2 - 3x + 2)(4x + 7)$

(586) Compute the quotient: $(2x^3 + 7x^2 - 9) \div (2x + 3)$

(587) Factor completely: $2x^2 + 5x - 12$

(588) Factor completely: $x^3 + x^2 - 14x - 24$

(589) Find the solution set of the equation $8x + 12 = 5x + 30$

(590) Find the solution set of the equation $x^2 + 3x = 18$

(591) Find the solution set of the equation $x^3 + x^2 = 2(7x + 12)$

(592) Mary is a year older than her spouse. In five years, their combined ages (measured in years) will total 53.

(593) Translate the English language statement "Mary is a year older than her spouse" into a mathematical language statement. *In other words, into an equation.*

(594) Translate the English statement "In five years, their combined ages will total 53" into a mathematical language statement.

(595) John and Mary had a fight planning their wedding, and Mary sped off in a huff, driving 52 miles per hour in her old car. John, after brooding for an hour, realized his foolish mistake and, knowing exactly where she's going, sped after her, driving 65

miles per hour in his sports car. How far away from home were they when he finally caught up to her?

(596) Simplify and rewrite without using either fractional or negative exponents: $\dfrac{\dfrac{\sqrt{125}xy^3}{3z}}{\dfrac{3x^2y^2}{5^{\frac{1}{2}}\cdot z^2}}$

(597) Multiply out and collect like terms: $(3x^2 - 4x + 2)(4x + 7)$

(598) Compute the quotient: $(2x^3 - x^2 + 2x + 12) \div (2x + 3)$

(599) Factor completely: $3x^2 - 9x - 12$

(600) Factor completely: $x^3 + x^2 - 30x - 72$

(601) Find the solution set of the equation $7x + 12 = 11x - 8$

(602) Find the solution set of the equation $x^2 + 3x = 28$

(603) Find the solution set of the equation $x^3 + x^2 = 2(15x + 36)$

(604) Mary keeps both a savings account and a checking account. She keeps \$500 more in her savings account than she keeps in her checking account, and if she put in another \$300 she'd have a total of \$2000 in those accounts.

(605) Translate the English language statement "She keeps \$500 more in her savings account than she keeps in her checking account" into a mathematical language statement. *In other words, into an equation.*

(606) Translate the English statement "if she put in another \$300 she'd have a total of \$2000 in those accounts" into a mathematical language statement.

(607) Thelma and Louise dash out after robbing a bank in Desert Gulch, hop into their getaway car and take off at its top speed of 60 miles per hour. By the time the police can take off after them, fifteen minutes have gone by so the police call their comrades in town Thelma and Louise seem to be heading to, Oasis, 50 miles away. The Desert Gulch police come after Thelma and Louise, while the Oasis police come towards them from the opposite direction. Both police cars are travelling at their top speed of 80 miles per hour.

Who catches Thelma and Louise first, and where? *All this action theoretically takes place in the midwest, where Professor McGavran grew up, the roads are all straight and there are no turn-offs.*

(608) Find the solution set of the equation $x^3 + 3x^2 = 28x + 60$.

(609) Find the solution set of the inequality $5x - 13 \leq 12x + 9$.

(610) Find the solution set of the inequality $20x + 96 > x^3 + 7x^2$.

(611) Define what is meant by (a) a function f and (b) the graph of a function f.

(612) Sketch the graph of the equation $x^2 + 8x + y^2 = 6y$. Make sure that everything important is clearly labelled.

(613) Sketch the graph of the equation $x^2 = 3(2x + y + 2)$. Make sure that everything important is clearly labelled.

(614) Sketch the graph of the equation $x^2 + 8 = 2(3x + 2y^2)$. Make sure that everything important is clearly labelled.

(615) Brent lent his brother Bob some money at 8% simple interest, and he lent his sister Betty half as much money at twice the interest rate. If Brent made a grand total of 24 cents in interest, then how much did he lend to each sibling?
(616) Find the solution set of the equation $20x + 96 = x^3 + 7x^2$.
(617) Find the solution set of the inequality $13x - 5 > 9x + 12$.
(618) Find the solution set of the inequality $x^3 + 3x^2 \leq 28x + 60$.
(619) Define what is meant by (a) a function f and (b) the graph of a function f.
(620) Sketch the graph of the equation $x^2 + y^2 + 8y = 6x$. Make sure that everything important is clearly labelled.
(621) Sketch the graph of the equation $x^2 = 3(2x + y + 2)$. Make sure that everything important is clearly labelled.
(622) Sketch the graph of the equation $x^2 + 26 = 2(6x + y)$. Make sure that everything important is clearly labelled.
(623) A pharmacist needs to obtain a 70% alcohol solution. How many ounces of a 30% solution must be mixed with 40 ounces of an 80% solution to obtain a 70% alcohol solution?
(624) Convert the radian measure to degrees: $13\pi/8$.
(625) Convert the degree measure to radians: 70 deg.
(626) For each of the following angles t, find $\sin t$, $\cos t$ and $\tan t$.
(627) $t = 5\pi/3$
(628) $t = 3\pi/4$.
(629) A right triangle contains a leg of length 8 opposite an angle of 23 deg. Find the other acute angle and the lengths of the other leg and the hypotenuse. *The numerical answers may be approximations.*
(630) A triangle contains a side of length 8 opposite an angle of 53 deg. If one of the other angles is 80 deg, find the size of the third angle along with the lengths of the other sides. *The numerical answers may be approximations.*
(631) For each of the following expressions, write them as simply as possible in terms of $\sin t$, $\cos t$, $\tan t$, $\csc t$, $\sec t$ and/or $\cot t$. In each case, explain in plain language how you obtained the identity.
(632) $\cos(-t)$
(633) $\sin(\frac{\pi}{2} - t)$
(634) $\sin(\pi - t)$
(635) $\tan(t + \pi)$
(636) Sketch the graph of the function $y = \sin x$ for $-4\pi \leq x \leq 4\pi$. Be sure to appropriately label the axes.
(637) Complete the following definition: $\arcsin x$ is ....
(638) Find the following.
(639) $\arcsin(-1/2)$
(640) $\sin(\arcsin(.2))$
(641) $\cos(\arcsin(-.2))$
(642) $\arcsin(\sin(9\pi/8))$

(643) A pendulum on a grandfather clock swings back an forth making a maximum angle of 5 deg with the vertical. If the pendulum in 10 inches long, what is the length of the arc it sweeps out as it swings back and forth once?
(644) A five foot six inch UConn/Waterbury student casts a shadow ten feet long. What is the angle of elevation of the sun? *Express the angle exactly and then obtain a decimal approximation in either radians or degrees.*
(645) Convert the radian measure to degrees: $15\pi/8$.
(646) Convert the degree measure to radians: 65 deg.
(647) For each of the following angles t, find $\sin t$, $\cos t$ and $\tan t$.
(648) $t = 4\pi/3$
(649) $t = 5\pi/4$.
(650) A right triangle contains a leg of length 12 adjacent to an angle of 27 deg. Find the other acute angle and the lengths of the other leg and the hypotenuse. *The numerical answers may be approximations.*
(651) A triangle contains a side of length 12 opposite an angle of 65 deg. If one of the other angles is 80 deg, find the size of the third angle along with the lengths of the other sides. *The numerical answers may be approximations.*
(652) For each of the following expressions, write them as simply as possible in terms of $\sin t$, $\cos t$, $\tan t$, $\csc t$, $\sec t$ and/or $\cot t$. In each case, explain in plain language how you obtained the identity.
(653) $\sin(-t)$
(654) $\cos(\frac{\pi}{2} - t)$
(655) $\tan(\pi - t)$
(656) $\cos(t + \pi)$
(657) Sketch the graph of the function $y = \cos x$ for $-4\pi \leq x \leq 4\pi$. Be sure to appropriately label the axes.
(658) Complete the following definition: $\arctan x$ is ....
(659) Find the following.
(660) $\arccos(-1/2)$
(661) $\cos(\arccos(.2))$
(662) $\cos(\arcsin(-.2))$
(663) $\arcsin(\sin(11\pi/8))$
(664) A pendulum on a grandfather clock swings back an forth making a maximum angle of 4 deg with the vertical. If the pendulum in 10 inches long, what is the length of the arc it sweeps out as it swings back and forth once?
(665) At 4:30pm, when the angle of elevation of the sun is 13 deg, a repair truck casts a shadow 50 feet long. How high is the truck? *The numerical answer may be an approximation.*
(666) For each of the following angles t, find $\sin t$, $\cos t$, $\tan t$, $\sec t$, $\csc t$ and $\cot t$.
(667) $t = 4\pi/3$
(668) $t = 7\pi/4$
(669) $t = 5\pi/6$

(670) A right triangle contains a leg of length 11 adjacent to an angle of 37 deg. Find the other acute angle and the lengths of the other leg and the hypotenuse. *The numerical answers may be approximations.*

(671) A triangle contains a side of length 17 opposite an angle of 64 deg. If one of the other angles is 72 deg, find the size of the third angle along with the lengths of the other sides. *The numerical answers may be approximations.*

(672) For each of the following values of θ, write each of $\sin\theta$, $\cos\theta$ and $\tan\theta$ as simply as possible in terms of $\sin t$, $\cos t$, $\tan t$, $\csc t$, $\sec t$ and/or $\cot t$. In each case, explain in plain language how you obtained the identity unless you are certain that the pictures you drew made your reasoning absolutely perfectly clear.

(673) $\theta = -t$

(674) $\theta = \dfrac{\pi}{2} - t$

(675) $\theta = \pi - t$

(676) $\theta = t + \pi$

(677) $\theta = t + 2\pi$

(678) $\theta = 2\pi - t$

(679) Find the following.

(680) $\arcsin(-\sqrt{3}/2)$

(681) $\sin(\arcsin(.7))$

(682) $\cos(\arcsin(-.7))$

(683) $\arcsin(\sin(2\pi/3))$

(684) $\arccos(\sin(-\pi/5))$

(685) A six foot five inch UConn/Waterbury student, a forward on its basketball team, casts a shadow ten feet long. What is the angle of elevation of the sun? *Express the angle exactly and then obtain a decimal approximation in either radians or degrees.*

(686) Two hours after sunrise, when the angle of elevation of the sun is 17 deg, the shadow of a tennis ball falls 45 feet from a point on the ground directly below the ball. How high is the tennis ball off the ground at that instant? *The numerical answer may be an approximation.*

(687) Simplify the following expressions as much as possible.

(688) $$\frac{\dfrac{x^2 - x - 6}{x + 2} + 4}{\dfrac{x + 1}{5}}$$

(689) $(\csc x + \cot x)(1 - \cos x)$

(690) Multiply $(3x^2 - 5\cos x + 2)(x - 3\tan x)$ and simplify as much as possible.

(691) Factor $x^3 + 6x^2 - 9x - 54$ as much as possible.

(692) Consider the function $f(x) = \dfrac{x^2 - 2x - 8}{x - 8}$.

(693) Find the solution set of the equation $f(x) = 0$.

(694) Find the solution set of the inequality $f(x) \leq 0$.

(695) Sketch the graphs of the following equations.

(696) $y = 3\sin(x - \pi/2)$

(697) $x^2 + 4x + y^2 = 9y + 12$
(698) Find $\sin\theta$, $\cos\theta$ and $\tan\theta$ for each of the following values of θ.
(699) $\theta = 3\pi/2$
(700) $\theta = 5\pi/6$
(701) $\theta = 5\pi/4$
(702) Write each of the following as simply as possible in terms of the functions $\sin x$, $\cos x$ and $\tan x$.
(703) $\sin(3\pi/2 - x)$
(704) $\cos(\pi - x)$
(705) Calculate each of the following.
(706) $\arcsin(cos(8\pi/9))$
(707) $\sin(\arccos(.1))$
(708) $\cos(5\pi/12)$ *Hint:* $1/4 + 1/6 = 5/12$.
(709) Verify the identity $\dfrac{1}{\sec x - \tan x} = \dfrac{1 + \sin x}{\cos x}$.
(710) Consider a triangle with angles of 40 deg and 70 deg and an included side of length 10. Find the lengths of the other two sides. *Approximate the lengths to within 0.01 of their actual values.*
(711) Kermit has just received an inheritance of \$15,000. Of that, \$5,000 was already invested in a funding paying interest at an effective annual yield of 5%, while another \$4,000 was invested in an instrument effectively yielding 7% annually. What must the effective yield of the remaining funds be in order that the effective annual yield of the entire \$15,000 be at least 7%? *Approximate the actual yield needed to within .01%.*
(712) x^2x^5
(713) $\dfrac{x^2}{x^5}$
(714) $(x^2)^5$
(715) $(xy)^5$
(716) $\left(\dfrac{x}{y}\right)^5$
(717) Rewrite without using radicals: $\sqrt[3]{t^2}$
(718) Rewrite without using radicals: $\dfrac{1}{\sqrt[5]{x^2}}$
(719) Rewrite without using fractional exponents: $(8x^4)^{3/2}$
(720) $(-x)^2$
(721) Solve for y: $7y + 9 = 2y + 3$
(722) x^4x^5
(723) $\dfrac{x^4}{x^5}$
(724) $(x^4)^5$
(725) $(xy)^4$

(726) $\left(\dfrac{x}{y}\right)^4$

(727) Rewrite without using radicals: $\sqrt[5]{t^3}$

(728) Rewrite without using radicals: $\dfrac{2}{\sqrt[6]{x^2}}$

(729) Rewrite without using fractional exponents: $(8x^6)^{3/4}$

(730) $(-x)^2$

(731) Solve for z: $3z - 9 = 8z + 56$

(732) Simplify as much as possible: $\dfrac{\left(y^3\sqrt{2x}\right)^2}{6xy} \cdot \dfrac{3y^{-2}}{y^3}$

(733) Perform the indicated multiplication and write the product as simply as possible: $(x+4)\cdot(\sqrt{x} - 4/\sqrt{x})$

(734) Perform the indicated multiplication and write the product as simply as possible: $(x^2 - 5x - 3)\cdot(2x - 7)$

(735) Factor completely: $x^3 + x^2 - 22x - 40$

(736) Simplify as much as possible: $\dfrac{\left(x^3\sqrt{2y}\right)^4}{\left(6x^2y\right)^3} \cdot \dfrac{3y^{-2}}{\left(x^3y^{-3/2}\right)^2}$

(737) Perform the indicated multiplication and write the product as simply as possible: $(2t+3)\cdot(2 - 3/t)$

(738) Perform the indicated multiplication and write the product as simply as possible: $(x^2 - 7x - 4)\cdot(3x - 5)$

(739) Factor completely: $x^3 + 3x^2 - 18x - 40$

(740) Find the solution set for the inequality $x^2 + x \geq 30$.

(741) Find the solution set for the inequality $\dfrac{(x-2)(x+7)}{x-5} < 0$.

(742) Find the solution set for the inequality $x^2 + 6 < 5x$.

(743) Find the solution set for the inequality $\dfrac{(x-3)(x+5)}{x-8} \geq 0$.

(744) Find the solution set for the inequality $x^2 + 5x < 24$.

(745) Find the solution set for the inequality $\dfrac{(x-8)(x+4)}{x-7} \geq 0$.

(746) Find the solution set for the inequality $x^2 + 10 > 7x$.

(747) Find the solution set for the inequality $\dfrac{(x+12)(x-5)}{x-9} \leq 0$.

(748) Find $f(-2)$ and $f(0)$.

(749) Find two different values of x for which $f(x) = 0$.

(750) Use your answers above to plot *exactly* four points on the graph of the function f. Clearly label each of the points with its coordinates.

(751) Find the distance between $(-2, f(-2))$ and $(0, f(0))$.

(752) Find the lengths of all the sides of the given right triangle, given that $\sin\alpha = 0.3$.

(753) Find the lengths of all the sides of the given right triangle, given that $\cos\alpha = 0.4$.

(754) Simplify the algebraic expression $(5x^2y^3)\cdot(3xy^8)$ as much as possible, rewriting it without the use of radicals or negative exponents.

(755) Simplify the algebraic expression $\dfrac{15x^2y^3}{3xy^8}$ as much as possible, rewriting it without the use of radicals or negative exponents.

(756) Simplify the algebraic expression $\left(\dfrac{2\sqrt{x}y^4}{x\sqrt[3]{y}}\right)^4$ as much as possible, rewriting it without the use of radicals or negative exponents.

(757) Simplify the algebraic expression $\dfrac{\frac{1}{x}-\frac{1}{2}}{x-2}$ as much as possible, rewriting it without the use of radicals or negative exponents.

(758) Calculate the product $(x^2+4x+3)\cdot(2x-7)$.

(759) Find the quotient $(x^4+x^3+2x^2+3x-10)\div(x+2)$.

(760) Factor $x^2+2x-48$ completely.

(761) Find all solutions of the equation $x^2+2x=48$.

(762) Factor x^3-6x^2-x+30 completely.

(763) Find all solutions of the equation $x^3+30=6x^2+x$.

(764) Use your calculator to calculate $\dfrac{3.1\cdot 2.1^{3.75}-1.3-2.7}{3.2+1.7\cdot 1.3^{1.1+1.6}-2.1}$, including at least six digits after the decimal point. The calculation should be done without doing any mental calculations or writing down and reentering any intermediate results. Write down the sequence of keypresses you used.

(765) Each item below contains part of a formula, which may be part of a definition. For each, complete the formula. In each case, a, b, c, x and y represent real numbers and m and n represent integers.

(766) $\left(\dfrac{x}{y}\right)^a =$

(767) If $c\neq 0$, then $\dfrac{ac}{bc} =$

(768) $a(b-c) =$

(769) $a^{-n} =$

(770) $a^{m/n} =$

(771) Simplify the algebraic expression $(3x^3y^2)\cdot(5x^8y)$ as much as possible, rewriting it without the use of radicals or negative exponents.

(772) Simplify the algebraic expression $\dfrac{3x^3y^2}{15x^8y}$ as much as possible, rewriting it without the use of radicals or negative exponents.

(773) Simplify the algebraic expression $\left(\dfrac{2\sqrt[3]{x}y^4}{x\sqrt{y}}\right)^4$ as much as possible, rewriting it without the use of radicals or negative exponents.

(774) Simplify the algebraic expression $\dfrac{\frac{1}{x}-\frac{1}{3}}{x-3}$ as much as possible, rewriting it without the use of radicals or negative exponents.

(775) Calculate the product $(x^2-4x+5)\cdot(2x+7)$.

(776) Find the quotient $(x^4+4x^3+2x^2+3x-160)\div(x+5)$.

(777) Factor x^2-x-30 completely.

(778) Find all solutions of the equation $x^2 = x + 30$.

(779) Factor $x^3 + x^2 - 14x - 24$ completely.

(780) Find all solutions of the equation $x^3 + x^2 = 14x + 24$.

(781) Use your calculator to calculate $\dfrac{3.1 \cdot 2.3^{3.65} - 1.3 + 2.7}{3.2 + 1.6 \cdot 1.2^{1.1+1.6} - 2.1}$, including at least six digits after the decimal point. The calculation should be done without doing any mental calculations or writing down and reentering any intermediate results. Write down the sequence of keypresses you used.

(782) Each item below contains part of a formula, which may be part of a definition. For each, complete the formula. In each case, a, b, c, x and y represent real numbers and m and n represent integers.

(783) $(xy)^a =$

(784) If $c \neq 0$, then $\dfrac{ac}{bc} =$

(785) $(a - b)c =$

(786) $a^{-n} =$

(787) $a^{m/n} =$

(788) Simplify $11a - 4b - (5a - 7b)$.

(789) Simplify $\left(\dfrac{-2x^2\sqrt[3]{y}}{(xy)^4}\right)^6$ as much as possible, rewriting it without negative and fractional exponents.

(790) Consider the arithmetic expression $\dfrac{5.1 \cdot 4.3^{1.2} - 3(5.2/2.5)}{3.1^{5.3-4.1} + 2.5 \cdot 1.3}$.

(791) Write down the sequence of keypresses needed to calculate the expression on a calculator without doing any mental calculations or writing down and reentering any intermediate results.

(792) Write down the value you obtained, including at least six digits after the

(793) Multiply $(x - 5) \cdot (x^2 - 3x + 4)$, simplifying the product as much as possible.

(794) Find the quotient $(x^4 + x^3 - x^2 + x - 42) \div (x + 3)$.

(795) Find the solution set to the inequality $|x - 15| = 7$.

(796) A rectangular picture frame is three inches higher than it is wide. It contains a photograph within a border one inch wide on all sides. If the area of the border is thirty six square inches, what are the dimensions of the frame?

(797) Find the solution set to the inequality $\dfrac{x + 7}{x - 2} \leq 0$.

(798) A University of Connecticut scholar drives from the Waterbury Campus to the Storrs Campus, averaging 50 miles per hour during the trip. She hits more traffic on the return trip and is only able to average 45 miles per hour returning. Assuming she drove the same distance each way, what was her average speed for the round trip?

(799) How many pounds of peanuts costing 40 cents per pount must be added to 2 pounds of cashews costing 65 cents per pound to create a mixture costing 53.5 cents per pound? *Find the exact amount needed and also give a reasonable decimal approximation.*