

Mathematics 109

Professor Alan H. Stein

Due Monday, November 7, 2005

Name: _____

This problem set is worth 50 points.

Make sure that you check the course website for instructions, fill out the pledge form and hand it in with your paper. The instructions for problem sets and take-home examinations along with the pledge form are available from the *General Policies* portion of the web site. *No paper will be accepted without a signed pledge form.* Remember that your paper may be handed in before the deadline but that no late papers will be accepted regardless of the reason. The course website also includes an explanation of how your average will be calculated if you fail to complete this assignment.

Note that, since most of the calculations involved can be done routinely using either a calculator or a symbolic manipulation program such as Maple or Mathematica, it will obviously be necessary to show, through your work, exactly how you came up with your solutions.

Remember, wherever feasible, to give an exact value before, where appropriate, giving a decimal approximation. For example, $\sqrt{3}$ is an exact value, while 1.732050808 is just a decimal approximation; $18 \sin(\pi/12)$ is an exact value, while 4.6587428 is a decimal approximation.

1. Find the set of values for which $x^3 - 7x^2 - 6x + 72$ is non-negative.
2. Complete each of the following statements:
 - (a) The logarithm of a product is equal to
 - (b) The logarithm of a quotient is equal to
 - (c) The logarithm of a number raised to a power is equal to
3. Assuming $b > 0$, $b \neq 1$, find $\log_b b^{7.3}$.
4. Assuming $b > 0$, $b \neq 1$, find $b^{\log_b 8.4}$.
5. Solve: $2^{3x-1} = 15$.
6. Assume you have deposited a significant sum of money in a bank account paying interest at an annual rate of 3.4%, compounded continuously. How long will it take for your balance to double? *Extra Credit: What interest rate would be needed for the balance to double in ten years?*
7. A fossil is discovered. It is known that the sample examined would have originally contained 0.014 grams of Carbon-14, but now contains just 0.005 grams of Carbon-14. How old is the fossil? *You may assume the half-life of Carbon-14 is 5730 years.*
8. The degree measure of an angle is 47.3° . What is its radian measure?
9. The radian measure of an angle is 2.18π . What is its degree measure?
10. The radian measure of an angle is 2.18. What is its degree measure?
11. A right triangle has hypotenuse of length 14. One of its acute angles is 37° . Find the other acute angle and the two legs. Clearly indicate the location of each leg. *One way of doing that would be, for each leg, to indicate whether it is adjacent to or opposite the 37° angle.*
12. Let $\theta = \arcsin 0.7$. Find $\cos \theta$.