
Algebra

Name: _____

Section No: _____

In your solutions to the exercises below, **show the algebraic work** that leads to the final answer.

Simplifying Algebraic Expressions

1. Simplify the expression $\frac{1}{3^{-2}} - \frac{1}{3} + \frac{1}{4^{-1}}$.
2. Simplify the expression $\frac{(x^2y^{-3})^2}{(y^{-3}x^{-2})^{-2}}$.
3. Simplify $(4x^6)^{3/2}$.
4. If $f(x) = x^2 + 3x$ and $h \neq 0$, then simplify $\frac{f(x+h) - f(x)}{h}$.
5. Simplify $\frac{1}{x+h} - \frac{1}{x}$.
6. Rationalize $\frac{3}{x - \sqrt{x}}$.

Intervals

7. Write in interval notation
 - (a) the open interval with endpoints 2 and 3,
 - (b) the closed interval with endpoints 2 and 3,
 - (c) the half-open interval with endpoints 2 and 3 that contains 2 but not 3.
8. Represent the following sets of numbers in two ways: interval notation and drawn as subsets of the number line:
 - (a) $1 \leq x < 3$,
 - (b) $-2 \leq x \leq 2$,
 - (c) $-5 < x \leq -3$.

Completing the Square

9. Complete the square for the following expressions:

(a) $x^2 - 8x + 12$,

(b) $s^2 + 3s - 6$.

10. Write the following expressions as a difference of squares:

(a) $x^2 + 4x$,

(b) $y^2 + 5y$.

Solving Equations

11. Solve for x in terms of y : $2y^2x - y^2 - (1 + 3y) = x$.

12. Find the solutions of $\frac{x^2}{3} + 2x - 1 = 0$ exactly (that is, not approximations).

13. Find the solutions of $\frac{1}{x-4} + \frac{1}{x+4} = \frac{4}{x^2-16}$ exactly.

14. Find the solutions of $\frac{1}{x} - \frac{1}{x+2} = 2$ exactly.

Factoring

15. Factor $x^2 - 2x - 24$.

16. Factor as much as possible $x^3 - a^2x$.

Exponential and Logarithmic Functions

17. Simplify

(a) $\frac{2^{5x}}{2^x}$

(b) $e^{2x}e^{-3x}$

(c) $\frac{e^{2x} - 1}{e^x - 1}$

(d) $\sqrt[3]{5^{2x}}$

18. Evaluate $\log_4(1/64)$.

19. Solve for x in the equation $\log_2 x + \log_2(x - 2) = 3$.

20. Solve for t in the equation $\ln t - \ln(t^2) = 5$ exactly.

Trigonometric Functions

21. On the unit circle mark off the following angles (in radians):

(a) $\frac{\pi}{2}$, π , and $-\frac{\pi}{2}$ together

(b) $\frac{\pi}{3}$ and $\frac{2\pi}{3}$ together.

22. Evaluate the following, where k is an integer in part d.

(a) $\sin\left(\frac{7\pi}{2}\right)$ (b) $\cos\left(\frac{-\pi}{2}\right)$ (c) $\sin(101\pi)$ (d) $\sin\left(\frac{\pi}{2} + 2k\pi\right)$.

Inverse Functions

23. Find the inverse of each of the following functions, including the domain, if an inverse exists.

(a) $f(x) = \frac{x}{1+2x}$ for $x \neq -\frac{1}{2}$ (b) $f(x) = \sqrt{18-2x^2}$ for $0 \leq x \leq 3$.

24. Find the inverse of each of the following functions, including the domain, if and inverse exists.

(a) $f(x) = \ln(e^{2x} + 1)$ for all x (b) $f(x) = \frac{e^x}{1+2e^x}$ for all x .

Graphs

25. Below is a graph of $y = f(x)$. Sketch the following graphs, using a new set of axes each time. Pay attention to translation, compression, and stretching of the graph.

(a) $y = f(x+1)$ (b) $y = f(x-1)$ (c) $y = f(2x)$ (d) $y = 2f(x)$.

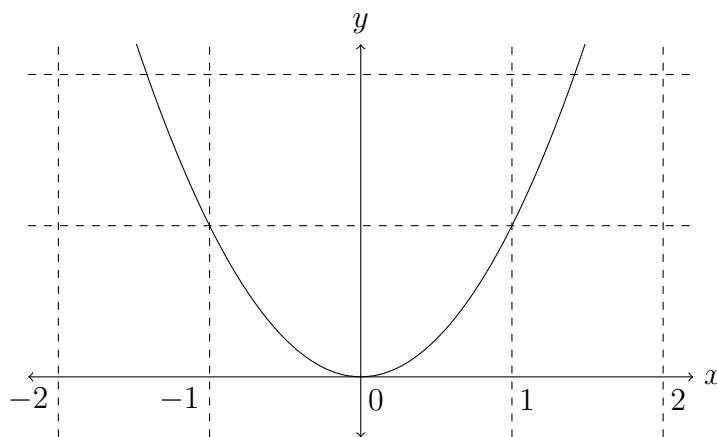


Figure 1: Graph of $y = f(x)$.