

1. Simplify:

a. $\frac{x+7}{x+3} - \frac{x-3}{x+7}$

b. $\frac{x-1}{x^2+4x+4} + \frac{x-1}{x+2}$

c. $\frac{5}{x-1} - \frac{3}{x}$

d. $\frac{x^2-13x+42}{x^2+10x+21} \div \frac{x^2-4}{x^2+x-6}$

e. $\frac{10x+20}{12y^4} \div \frac{x^2-4}{3xy-6y}$

f. $\frac{2 - \frac{6}{x}}{\frac{x}{9} - \frac{1}{x}}$

g. $64^{-\frac{1}{3}}$

h. $-9^{3/2}$

i. $\left(\frac{64x^{4/3}}{x^{-2/3}}\right)^{1/2}$

j. $\sqrt[3]{24a^5b^9c^{11}}$

k. $\sqrt[3]{-8a^{15}b^{11}}$

l. $\frac{3x^{-1} + x^{-2}}{(2x)^{-1} + 1}$

m. $\frac{\frac{1}{x} - \frac{2}{x+3}}{\frac{5}{x+3}}$

n. $\frac{25-x^2}{x^2-8x+15}$

2 Rational denominator and simplify

a. $\frac{6}{2+\sqrt{7}}$

b. $\frac{2\sqrt{6}}{5-\sqrt{3}}$

c. $\frac{\sqrt[3]{5}}{\sqrt[3]{4xy^5}}$

3. Multiply or divide and simplify

a. $(6-2i)(3+4i)$

b. $(\sqrt{6}-9i)(\sqrt{6}+9i)$

c. $\frac{9-3i}{2i}$

d. $\frac{3i}{2-i}$

4. Solve equations (check for extraneous solutions)

a. $\frac{4}{x+3} + \frac{8}{x^2-9} = 0$

b. $\frac{4}{y} - \frac{5}{3} = -\frac{1}{5}$

c. $\sqrt{x^2-7} + 3 = 0$

d. $x^2 + 2x - 5 = 0$

e. $5x^2 - 2x = 7$

f. $(9n+1)^2 = 9$

g. $x^4 - 8x^2 - 9 = 0$

h. $x^{2/3} - 6x^{1/3} + 5 = 0$

i. $x^2 - 6x = -2$

j. $(x+1)^2 - 15(x+1) + 56 = 0$

k. $8x^3 + 27 = 0$

l. $\frac{x+4}{x+1} + \frac{5}{x+2} = \frac{3x+16}{x^2+3x+2}$

5. Solve each inequality for x, graph the solution set and write each solution set in interval notation.

a. $x^2 - 5 > 4x$

b. $\frac{x-5}{x+4} \geq 0$

c. $\frac{x+1}{x-3} \leq 2$

6. Solve each system equation

a.
$$\begin{cases} x + 3y - z = 5 \\ 2x - y - 2z = 3 \\ x + 2y + 3z = 4 \end{cases}$$

b.
$$\begin{cases} x^2 + y^2 = 25 \\ x - y = 7 \end{cases}$$

c.
$$\begin{cases} x^2 + 4y^2 = 5 \\ y - x = 0 \end{cases}$$

d.
$$\begin{cases} x^2 + y^2 = 16 \\ 3x^2 - y^2 = 20 \end{cases}$$

7. Graph of each function. If the graph is a circle, find the center and radius. If the

graph is a parabola, find its vertex, x and y-intercepts and axis of symmetry.

a. $x^2 + y^2 + 6x + 10y - 2 = 0$

b. $x^2 + y^2 + 6x - 8y - 11 = 0$

c. $y = -x^2 - 4x + 2$

d. $x = 2(y - 2)^2 + 4$

8. Identify each equation as an ellipse, a parabola, a circle or a hyperbola. Then graph.

a. $16x^2 + 9y^2 = 144$

b. $x^2 - 9y^2 = 36$

c. $25y^2 - 5x^2 = 125$

d. $y = x^2 + 4x + 6$

9. Given $f(x) = \frac{2}{5}x + \frac{1}{5}$ find:

a. $f(-5)$

b. $f^{-1}(x)$

c. Graph f and f^{-1} on the same x, y axis

10. Find the inverse function of

a. $f(x) = \frac{2x+5}{3}$

b. $f(x) = \frac{x+2}{x-4}$

c. $f(x) = 5^{x-1}$

d. $f(x) = \log(x)$

e. $f(x) = \sqrt[3]{x+4}$

11. Write in logarithmic form:

a. $a = 4^y$

b. $5^3 = 125$

12. Write as an exponential equation:

a. $\log_2 64 = 6$

b. $C = \log_B A$

13. Simplify:

a. $\log_3 1 - \log_3 81$

b. $e^{\ln(t+1)}$

c. $\log_7 1 - \log_5 5^m$

d. $64^{-2/3}$ e. i^{29} f. $\sqrt{-108}$

14. Solve each equation:

a. $\log_2(x+4) + \log_2(x-4) = 1$

b. $8 = 4^{x+6}$

c. $\log_3(x+6) - \log_3 x = 2$

d. $(x+7)^2 = 16$

e. $x^2 - 2x - 8 = 4$

f. $\sqrt{10x+24} = x$

g. $x^4 + x^2 - 12 = 0$

h. $1 - \frac{4}{x+6} = \frac{4}{x}$

i. $\log_2(x+6) + \log_2 x = 4$

15. Find the exact solutions and then approximate to 4 decimal places.

a. $18 = 9^{x+1}$

b. $6^x = 50$

c. $\ln(2x-1) = 1.6$

16. Solve for t (give your answer accurate to 3 decimal places).

a. $5000 = 1000e^{0.02t}$

b. $18000 = 10000 \left(1 + \frac{0.04}{4}\right)^{4t}$

17. Graph each function:

a. $y = \left(\frac{1}{2}\right)^x + 5$

b. $y = \log_{1/2} x$

c. $y = -4^x$

18. Problem solving (from textbook)

Page 429: #33 and 35

Page 492: #36, 51

Page 680: #65

Page 543: #39

Page 631: #61 and 63

Page 741: #17, and Page 768: #41

19. Suppose \$3000 is invested into an account paying 2.6% interest compounded quarterly. How much will the account be worth in 5 years? Use $A = P \left(1 + \frac{r}{n}\right)^{nt}$

20. Working together Maria and Vivian can paint a room in 3 hours. Working alone it would take Vivian 12 hours to paint the room. How long would it take Maria to paint the room alone?

21. The maximum weight that a rectangular beam with square cross sections can support varies directly with the cube of the width and inversely with the length of the beam. If a beam that is 4 inches wide and 60 inches long can support 5 tons, how much weight can a similar beam that is 3 inches wide and 72 inches long support?

22. Graph the parabola $y = -x^2 + 6x - 8$
Find: a/ the vertex, b/ the x- and y-intercept, if any.

23. Solve the system:

$$\begin{cases} x + 2y + 3z = 13 \\ 2x - y + z = 11 \\ x + y - 2z = -16 \end{cases}$$

24. If \$4000 is put into an account paying 3.2% interest compounded continuously. How long will it take for the account to be worth \$6000? Use $A = Pe^{rt}$

25. Given $f(x) = \frac{4}{x+6}$ and $g(x) = 6x - 1$

- Find the domain of $f(x)$.
- Find $(f \circ g)(x)$ and $(g \circ f)(x)$
- Find $(f \circ g)(3)$
- Find $g^{-1}(x)$

26. Let $f(x) = 3x - 1$ and $g(x) = x - 8$

Find:

- $(f - g)(x)$
- $\left(\frac{f}{g}\right)(x)$
- Find the domain of $\left(\frac{f}{g}\right)(x)$

27. Write as a single radical: $(\sqrt[3]{2a})(\sqrt[4]{a^3})$

28. Perform the indicated operations and simplify.

- $\sqrt{48} - 5\sqrt{27} + \sqrt{8}$
- $x\sqrt[3]{375x} + 2\sqrt[3]{24x^4}$
- $(\sqrt[5]{4a^7b^3})(\sqrt[5]{16a})$
- $(\sqrt{2} - 5)(\sqrt{2} + 3) - 7\sqrt{2} + 1$

29. Find the domain and range for:

- $f(x) = \sqrt[3]{3x + 1}$
- $f(x) = \sqrt[4]{5x - 8}$
- $f(x) = \sqrt{x - 2} + 8$
- $f(x) = 2^{x-3} + 1$
- $f(x) = \log_2(x + 3)$
- $\frac{x^2}{16} + \frac{y^2}{25} = 1$

30. Wonderland has a population of 1000 in 2010. The population increases 4.3% per year. Predict the population in 2025.

31. The half-life of a radioactive substance is 35 days. How much of a 400 gram sample remains after 147 days?

32. A pilot flies 630 miles with a tailwind of 35 miles per hour. Against the wind, he flies only 455 miles in the same amount of time. Find the rate of the plane in still air.

33. A granola bar company's profit P in cents from selling X boxes of granola bars is given by equation: $P(x) = 480x - x^2$
Find how many boxes of granola bars must be sold to maximize their profit, and find maximum profit.

34. Vocabulary:

a. Circle all of the following that are graphs of functions that have an inverse function.

- Circle
- Exponential function
- Upward parabola function
- A line

b. Which of the following is true?

- $\log_2 7 - \log_2 5 = \log_2 \left(\frac{7}{5}\right)$
- $\log_2 7 - \log_2 5 = \frac{\log_2 7}{\log_2 5}$
- $\log_2(x + 5) = \log_2 x + \log_2 5$
- $\log_2(x + 5) = (\log_2 x)(\log_2 5)$

c. Be familiar with the definitions and/or context in which these words are used: inverse; composition; asymptote; vertex; LCD; proportion; domain; range; x/y-intercepts; one-to-one function; quadratic, rational, radical, exponential, logarithmic functions/equations; variation.

GOOD LUCK!