

- Solve each of the following inequalities.
  - $(x - 1)(x + 13) \leq 0$
  - $\frac{x - 1}{x + 13} \leq 0$
  - $(x - 5)x(x + 9) \geq 0$
  - $\frac{x - 5}{x(x + 9)} \geq 0$
- True or false? Explain your answer or show computation to support it.
  - For every real number  $m$ ,  $2 - m = -(m - 2)$
  - For every real number  $m$ ,  $(2 - m)^2 = -(m - 2)^2$ .
  - For every real number  $m$ ,  $(2 - m)^3 = -(m - 2)^3$
- Simplify each of the following.
  - $\frac{12^n}{2^{2n}}$
  - $\left(\frac{64}{27}\right)^{-1/3}$
  - $5^a \cdot 5^{-2a}$
- Simplify each of the following.
  - $\log_5 125$
  - $\log_{10} \left(\frac{1}{100}\right)$
  - $\log_2 \left(\frac{1}{8}\right)$
  - $\log_{32} 16$
  - $\log_{1/3} 1$
  - $\log_{1/100} 10$
  - $\log_{16} 8$
- Find the coordinates of the point(s) where the graphs of  $y = x^2 + 6x + 5$  and  $y = 12x - 3$  intersect.
- Write a quadratic equation in  $x$  and  $y$  satisfying both of the following conditions:
  - the leading coefficient is  $-2$ .
  - the graph of the equation is a parabola with  $x$ -intercepts  $(-4, 0)$  and  $(5, 0)$ .
- Write a quadratic equation in  $x$  and  $y$  satisfying both of the following conditions:
  - the leading coefficient is  $1$ .
  - the graph of the equation is a parabola with vertex  $(5, 2)$ .
- Graph each of the following in the same coordinate system.
  - $f(x) = 2^x$  and  $g(x) = \log_2 x$
  - $f(x) = 2^x$  and  $g(x) = \left(\frac{1}{2}\right)^x$
- The location of an object, measured in meters, is given by  $L(t) = 3t^3 - 10t + 8$ , where  $t$  is measured in seconds. Find the average velocity of the object between
  - $t = 2$  s and  $t = 2.5$  s
  - $t = 2$  s and  $t = 2.01$  s
  - $t = 2$  s and  $t = 2.001$  s
- Given that  $f(x) = -5x + 3$ , find
  - $f(-7)$
  - $f(2a)$
- Given that  $f(x) = \sqrt{2x - 1}$ , find
  - $f(5)$
  - $f(25)$
  - $f(x + h)$
- Given  $f(x) = \sqrt{x + 10}$  and  $g(x) = 2x^2 + 7$ , find
  - $f(g(4))$
  - $g(f(6))$
  - $f(g(x))$
  - $g(f(x))$

13. Graph the function  $f(x) = \frac{2x - 10}{x - 5}$ . Explain why the functions  $f(x)$  and  $g(x) = 2$  are different functions.
14. Consider the function  $f(x) = \frac{1}{x}$
- Define  $g(x) = f(x) + 5$ . Graph  $f$  and  $g$  in the same coordinate system. How do the two graphs relate to each other?
  - Define  $h(x) = f(x + 5)$ . Graph  $f$  and  $h$  in the same coordinate system. How do the two graphs relate to each other?
  - Define  $k(x) = \frac{1}{f(x)}$ . Graph  $f$  and  $k$  in the same coordinate system.
  - Define  $m(x) = (f(x))^2$ . Graph  $f$  and  $m$  in the same coordinate system.
15. Suppose that  $f(x) = x^2$  and  $g(x) = 6x - 5$ .
- Find the formula for  $g(f(x))$ .
  - Find the formula for  $f(g(x))$ .
16. For all values of  $m$ , the graph of the equation  $y = mx - 7m + 8$  is a straight line, passing through a fixed point.
- Find the coordinates of this point.
  - Find all values of  $m$  for which the line  $y = mx - 7m + 8$  and the parabola  $y = \frac{1}{2}x^2 - 6x + 30$  has exactly one point in common.
17. Find an equation for all tangent lines drawn to the graph of  $y = -\frac{1}{2}x^2 + 7x - 10$  from the point  $(3, 7)$ .
18. Solve the equation  $|2x - 6| - 2 = 2$  using the graphs of  $f(x) = |2x - 6| - 2$  and  $g(x) = 2$ .
19. The balance in a bank account after  $t$  years is  $A(t) = \$1000 + \$1000rt$ , where  $r$  is the interest rate. (Note: if the interest rate is 5%, that means  $r = 0.05$ , and NOT 5)
- What does  $A(8)$  mean?
  - How much money is there in the account after four years if  $r = 0.08$ ?
  - Plot the graph of  $A(t)$  with  $r = 0.08$ .
  - For the account balance to reach \$1250 in two years, the interest rate  $r$  must be greater than what value?
20. Find each of the following limits.
- $\lim_{x \rightarrow \infty} \frac{1}{x}$
  - $\lim_{x \rightarrow -\infty} \frac{1}{x}$
  - $\lim_{x \rightarrow \infty} \frac{3}{x^2 - 8}$
  - $\lim_{x \rightarrow \infty} \frac{x^2 + 9}{5x + 2x^2 - 3}$
  - $\lim_{x \rightarrow -\infty} \frac{x^3 - 9x + 1}{x^2 - 2x - 15}$