

1. (a) Give the equation of a circle of radius 7 centered at the point  $(-1, 3)$ .  
 (b) Sketch the graph of this circle.  
 (c) Does this graph represent a function? Justify your answer.
2. Given the points  $A : (-2, 4)$  and  $B : (7, -1)$ :  
 (a) Find the distance between  $A$  and  $B$   
 (b) Find an equation for the line containing  $A$  and  $B$   
 (c) Find the equation for the line through the origin and perpendicular to  $\overleftrightarrow{AB}$
3. Given the equation  $4x + 3y = -2$   
 (a) Find the slope of the line represented by this equation.  
 (b) Find the  $x$  and  $y$  intercepts for this line.  
 (c) Give an equation for a line through  $(-2, 4)$  that is parallel to this line.
4. Suppose you own a company that manufactures widgets. Your supplier sells you the widgets wholesale at \$8 apiece. It costs you \$750 a month to rent your store, and you spend an additional \$2150 each month on utilities, supplies, and employee salaries. You sell the widgets at a retail price of \$15 apiece.  
 (a) Find an equation  $C(x)$  that gives your monthly costs, where  $x$  is the number of widgets you purchase for sale that month.  
 (b) Find equations for your monthly revenue,  $R(x)$ , and your monthly profit,  $P(x)$ , assuming that you sell all of the new widgets that you purchase.  
 (c) How many widgets do you need to sell each month in order to break even?  
 (d) Suppose that instead of purchasing your widgets wholesale, you could instead build a factory and make your own widgets for only \$4 apiece. If the factory would cost \$750,000 to build, but all of your other costs would remain the same, how many widgets would you need to sell during the lifetime of the factory in order to make the construction worthwhile?
5. Simplify the following:
  - (a)  $\left(\frac{3}{4}\right)^{-2}$
  - (b)  $\left(\frac{y^{12}}{25z^4}\right)^{-\frac{3}{2}}$
  - (c)  $\sqrt[5]{32x^{11}y^{14}z^8}$
  - (d)  $\left(\frac{(5xyz)^2z^{-2}}{2x^{-2}y^2z^{-4}}\right)^{-1}$
  - (e)  $\frac{3x^2 - 10x + 3}{x^2 + x - 1} \cdot \frac{x^2 + x - 2}{x^2 - 9}$
  - (f)  $\frac{2x^2 + 4}{2x^2 + 7x - 4} - \frac{x - 1}{x + 4}$
  - (g)  $\frac{\frac{1}{x} + \frac{3}{x-2}}{\frac{4}{x-1} - \frac{2}{x-2}}$
  - (h)  $\frac{\frac{3}{2x+2h+1} - \frac{3}{2x+1}}{h}$

6. Rationalize the denominator in the following expressions:

(a)  $\frac{3x}{\sqrt[3]{x}}$

(b)  $\frac{2x+3}{\sqrt{2x-1}}$

7. Factor each of the following expressions completely:

(a)  $2x^2 + x - 6$

(b)  $50x^2 + 45x - 18$

(c)  $16x^2 - 25y^2$

(d)  $6x^3y - 27x^2y - 15xy$

(e)  $3x^3 + x^2 - 3x - 1$

8. Suppose that the supply and demand for a product are given by the equations  $2p + 3x = 90$  and  $4p - 2x = 100$ , where  $x$  is the quantity sold, in thousands, and  $p$  is the price in dollars. Find the equilibrium price for this product, and the quantity sold at this price.

9. Find the values of  $x$  that satisfy the inequality  $x^2 - 2x - 3 < 0$ . Graph your solution on a number line.

10. Find the values of  $x$  that satisfy the inequality  $|3 - 4x| > 9$ . Graph your solution on a number line.

11. Given the function  $f(x) = \frac{2}{x-4}$

(a) What is the domain of  $f$ ? Give your answer in interval notation.

(b) Find  $f(12)$

(c) Find  $f(2a+4)$

(d) Find  $\frac{f(a+h) - f(a)}{h}$ . Simplify your answer.

12. Given that  $f(x) = \frac{1}{3x-2}$  and  $g(x) = \sqrt{x^2-4}$

(a) Find  $\frac{g}{f}(x)$

(b) Find  $g \circ f(x)$

(c) Find  $f \circ g(2)$

(d) Find the domain of  $\frac{g}{f}$ ? Give your answer in interval notation.