

## Review Problems

- Factor completely by completing the square or state if the expression does not factor.
  - $x + 2x^2 - 15$
  - $2x + x^2 + 26$
  - $12x - 2x^2 - 4$
  - $4x^2 - 24x - 64$
- Find the coordinates of all points where the graphs of the given equations intersect each other.
  - $y = x^2 - 6x + 14$  and  $y = 4x - 7$
  - $(x + 2)^2 + (y + 2)^2 = 50$  and  $(x - 2)^2 + (y - 1)^2 = 25$
  - $y = -\frac{1}{2}x^2 + 5x - 2$  and  $y = 9x + 6$
- Find an equation of the tangent line drawn to the circle  $4y + x^2 + y^2 = 6x - 3$  to the point  $(6, -1)$ .
- Find the equation of the circle that passes through the points  $(0, 0)$ ,  $(0, 8)$ , and  $(-6, 0)$ .
- What is the remainder when we divide  $3x^4 - x^3 + 2x^2 + 5x - 6$  when divided by
  - $x - 2$
  - $x + 1$
  - $x^2 - 2$
- Simplify each of the following expressions.
  - $\sqrt{125} - 3\sqrt{80} + \sqrt{45}$
  - $(\sqrt{7} - 2)^2$
  - $(\sqrt{3} - 1)^3$
  - $\log_9 \frac{1}{27}$
  - $2^{\log_8 x}$
  - $\log_4 27 - 2\log_2 6$
- Rationalize the denominator in each of the following expressions.
  - $\frac{3}{\sqrt{5}}$
  - $\frac{1}{\sqrt{10} - 3}$
  - $\frac{2}{\sqrt{7} + 1}$
- Find the exact value of  $x^2 - 4x + 6$  if
  - $x = 2 - \sqrt{3}$
  - $x = 2\sqrt{5} - 1$
- One side of a rectangle is 18 in shorter than the other side. Find the sides of the rectangle if its area is  $360 \text{ in}^2$ .
- Consider the points  $A(-3, -5)$  and  $B(3, 3)$ .
  - Find the distance between these points.
  - Let  $M$  be the midpoint of the line segment determined by  $A$  and  $B$ . Find the coordinates of  $M$ .
  - Find the distance between  $A$  and  $M$ .
- Consider the function  $f(x) = \frac{x - 12}{x^2 + 6x - 216}$ .
  - Find the domain of  $f$ .
  - Find the  $y$ -intercept of  $f$ .
  - Find the  $x$ -intercept(s) of  $f$ .
- Consider the function  $g(x) = \sqrt{2x^2 - 50}$ .
  - Find the domain of  $g$ .
  - Find the  $y$ -intercept of  $g$ .
  - Find the  $x$ -intercept(s) of  $g$ .
- Find the inverse for each of the following functions.
  - $f(x) = e^{3x-1}$
  - $f(x) = 2x^3 - 1$
  - $f(x) = \frac{3x - 1}{5x + 2}$
- Among the rectangles of perimeter 12 m, which one has the largest area?
- If we set the price of our product to be \$18 per item, then we can sell 300 items. For every dollar we raise the price, we can sell 5 less items.
  - How much is the total income if we price the product at \$21?
  - What price would guarantee an income of \$6625?
  - What price would guarantee the possible highest income? What is the highest possible income?

16. A manufacturer estimates that when  $q$  units of a particular commodity are produced each month, the total cost will be  $C(q) = 0.4q^2 + 3q + 40$  thousand dollars, and all  $q$  units can be sold at a price of  $p(q) = 22.2 - 1.2q$  thousand dollars per unit. Find the maximal profit.
17. We are standing on the top of a 720 ft tall building and throw a small object upward. The object's distance, measured in feet, after  $t$  seconds is

$$h(t) = -16t^2 + 192t + 720$$

- a) How high is the object after 3 seconds? (In short, find  $h(3)$ .)  
 b) How high is the object after 5 seconds? (In short, find  $h(5)$ .)  
 c) Compute the average velocity of the object between  $t = 3$  seconds and  $t = 5$  seconds.  
 d) Compute the average velocity of the object between  $t = 8$  seconds and  $t = 10$  seconds.  
 e) How long does it take for the object to hit the ground?  
 f) What is the highest point that the object reaches?

### Review Problems - Answers

1. a)  $(2x - 5)(x + 3)$     b) does not factor    c)  $-2(x - 3 + \sqrt{7})(x - 3 - \sqrt{7})$     d)  $4(x + 2)(x - 8)$
2. a)  $(7, 21)$  and  $(3, 5)$     b)  $(-1, 5)$  and  $(5, -3)$     c)  $(-4, -30)$
3.  $y + 1 = -3(x - 6)$  or  $y = -3x + 17$
4.  $(x + 3)^2 + (y - 4)^2 = 25$
5. a) 52    b) -5    c)  $3x + 10$
6. a)  $-4\sqrt{5}$     b)  $11 - 4\sqrt{7}$     c)  $-10 + 6\sqrt{3}$     d)  $-\frac{3}{2}$     e)  $\sqrt[3]{x}$     f)  $-\frac{1}{2}\log_2 3 - 2$  or  $\log_2\left(\frac{1}{\sqrt{3}}\right) - 2$
7. a)  $\frac{3\sqrt{5}}{5}$     b)  $\sqrt{10} + 3$     c)  $\frac{\sqrt{7} - 1}{3}$
8. a) 5    b)  $31 - 12\sqrt{5}$
9. 12 in 30 in
10. a) 10    b)  $(0, -1)$     c) 5 units
11. a)  $x \neq -18, 12$     b)  $\frac{1}{18}$     c)  $(12, 0)$
12. a)  $(-\infty, -5] \cup [5, \infty)$     b) there is none    c)  $(-5, 0)$  and  $(5, 0)$
13. a)  $f^{-1}(x) = \frac{1}{3}(\ln x + 1)$     b)  $f^{-1}(x) = \sqrt[3]{\frac{1}{2}(x + 1)}$     c)  $f^{-1}(x) = \frac{2x + 1}{-5x + 3}$
14. the square
15. a) \$5985    b) \$25 and \$53    c) \$7605 with a price of \$39
16. \$17600
17. a) 1152 ft    b) 1280 ft    c)  $64\frac{\text{ft}}{\text{s}}$     d)  $-96\frac{\text{ft}}{\text{s}}$     e) 15 s    f) 1296 ft