5. Sketch a graph of each function.

a) $y = x(x - 3)(x - 2)$

b) $y = -(x - 1)(x - 2)(x - 3)$

c) $y = x(x - 1)^2$

d) $y = (x + 2)^3$

6. Sketch an example of a cubic function with the given zeros. Then write an equation of the function. Is the equation unique? Explain.

a) −2, 1, 4

b) 3 (of order 3)

c) −2, 2 (of order 2)

7. Sketch a graph of each function.

a) $y = x(x + 1)(x - 2)(x - 4)$

b) $y = x^2(x + 2)^2$

c) $y = x(x + 3)^3$

d) $y = (x - 1)^4$

8. Sketch an example of a quartic function with the given zeros. Then write an equation of the function. Write the equations of two other functions that belong to the same family.

a) −3, −2, 1, 4

b) −1 (of order 2), 2 (of order 2)

c) −3, 0, 3 (of order 2)

d) 3 (of order 4)

9. Which statements are true and which are false? Explain.

a) Not all quadratic functions have zeros.

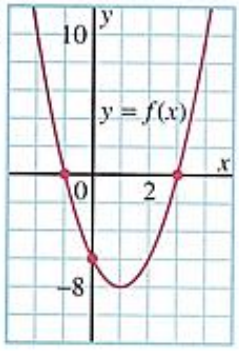
b) Not all cubic functions have zeros.

c) Every cubic function has at least one zero.

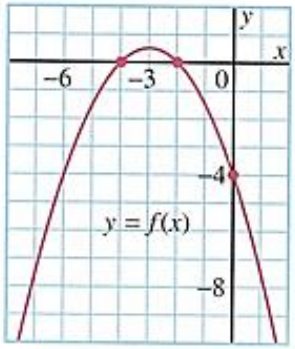
d) Every quartic function has at least one zero.

10. Determine the equation of each quadratic function.

a)



b)



11. Sketch a graph of each function.

a) $y = (x - 2)^2(x + 1)$

b) $y = -x(x + 3)(x - 1)(x + 2)$

c) $y = -3(x + 5)(x + 4)$

d) $y = (x + 1)^2(x - 3)^2$

14. Determine the equation of each function, then sketch its graph.

a) quadratic function with zero 2 (of order 2); graph has y-intercept 12

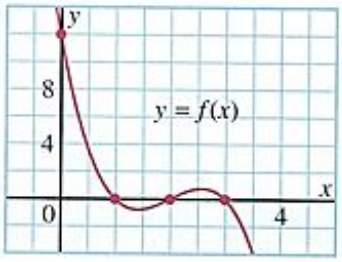
b) cubic function with zeros −2, 1, 4; graph has y-intercept 24

c) cubic function with zeros −2 and 2 (of order 2); graph has y-intercept −16

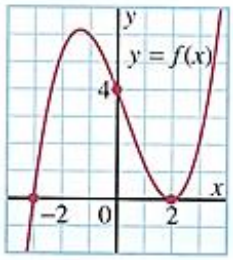
d) cubic function with zeros 0, 2, 4; graph passes through (3, 9)

16. Determine the equation of each cubic function.

a)

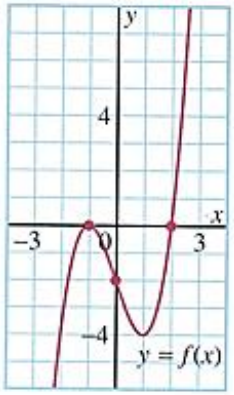


b)

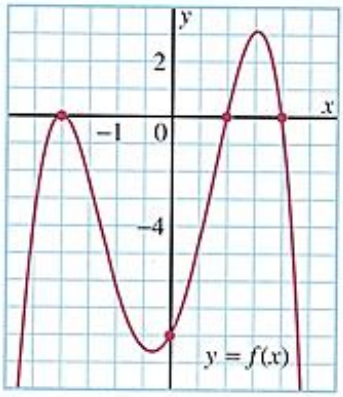


17. Determine an equation to represent the graph of each polynomial function.

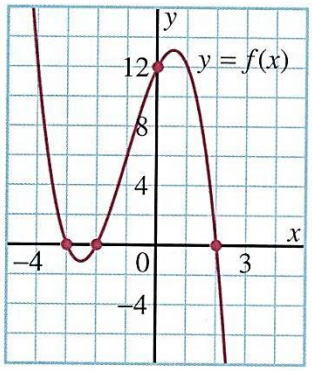
a)



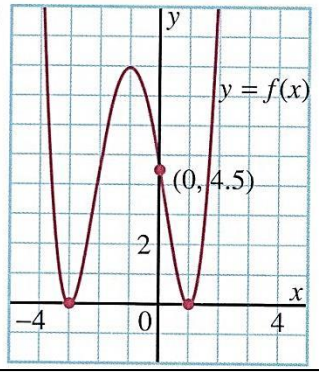
b)



c)



d)



6. No equation is unique. Equations may vary.
a) $y = (x + 2)(x - 1)(x - 4)$
b) $y = (x - 3)^3$
c) $y = (x + 2)(x - 2)^2$

8. Answers may vary. Sample answers follow.
a) $y = (x + 3)(x + 2)(x - 1)(x - 4)$;
$y = 2(x + 3)(x + 2)(x - 1)(x - 4)$;
$y = -3(x + 3)(x + 2)(x - 1)(x - 4)$
b) $y = (x + 1)^2(x - 2)^2$;
$y = 2(x + 1)^2(x - 2)^2$;
$y = -3(x + 1)^2(x - 2)^2$
c) $y = x(x + 3)(x - 3)^2$;
$y = 2x(x + 3)(x - 3)^2$;
$y = -3x(x + 3)(x - 3)^2$
d) $y = (x - 3)^4$;
$y = 2(x - 3)^4$;
$y = -3(x - 3)^4$

9. **a)** True
b) False
c) True
d) False

10. **a)** $y = 2(x + 1)(x - 3)$
b) $y = -\frac{1}{2}(x + 4)(x + 2)$

14. **a)** $y = 3(x - 2)^2$
b) $y = 3(x + 2)(x - 1)(x - 4)$
c) $y = -2(x + 2)(x - 2)^2$
d) $y = -3x(x - 2)(x - 4)$

16. **a)** $y = -2(x - 1)(x - 2)(x - \sqrt{3})$
b) $y = \frac{1}{3}(x + 3)(x - 2)^2$

17. **a)** $y = (x + 1)^2(x - 2)$
b) $y = -(x + 2)^2(x - 1)(x - 2)$
c) $y = -(x + 3)(x + 2)(x - 2)$
d) $y = \frac{1}{2}(x + 3)^2(x - 1)^2$