3.1: Quadratic Functions

1. The range of the function $f(x) = -\frac{1}{3}x^2 + 2x + 7$, is

   A) $(-\infty, 10]$

   B) $(-\infty, 3]$

   C) $(-\infty, 7]$

   D) $[10, \infty)$

   E) $[3, \infty)$

2. Given the function $f(x) = x^2 + 4x + 2$ with domain $[-3, -2]$, then the maximum value of the graph of $f(x)$ is

   A) -1

   B) 2

   C) 0

   D) -2

   E) NO maximum value

3. If $-3 \leq x \leq 0$, then the range of the function $f(x) = (x+1)^2 + 1$

   is equal to

   A) $[1,5]$

   B) $[2,5]$

   C) $[1, \infty)$

   D) $[2, \infty)$

   E) $[5, \infty)$

4. If $(2, -1)$ is the lowest point on the graph of a quadratic function

   $f(x) = ax^2 - 8x + c$, then $a + c =$

   A) 9

   B) 0

   C) 1

   D) 11

   E) -2

5. If the line $2x + 3y = 2$ passes through the vertex of the parabola $y = -2x^2 + 4x + c$, then c is equal to

A) -2
B) -1
C) -3
D) $-1/2$
E) $-1/3$

6. If the graph of the quadratic function $f(x) = -2x^2 + 3x + c$ intersects the x-axis at two different points, then c is any number in the interval

A) $(-9/8, \infty)$
B) $(-3, \infty)$
C) $(-3, -9/8)$
D) $(-3/2, \infty)$
E) $(-3/2, -9/8)$

7. A ball is thrown directly upward and the height function is given by the equation $h(t) = -16t^2 + 80t + 32$ where t is time in seconds. The time interval is seconds for which the ball will be more than 96 feet above the ground is

A) (1,4)

B) (2,8)

C) (2,5)

D) (3,6)

E) (4,8)

8. Which one of the following statements is TRUE about the graph of the function $f(x) = -2x^2 + 2x + 3/2$?

A) The graph is decreasing on $[1/2, \infty)$

B) The graph has no x-intercept

C) The vertex is the point $(1/2, 3/2)$

D) The range is $(-\infty, 3/2]$

E) The axis of symmetry is the line $y = 1/2$

9. The graph of the function $f(x) = -x^2 + 14x - 47$ is

A) increasing over $(-\infty, 7]$ and has range $(-\infty, 2]$

B) increasing over $(-\infty, 2]$ and has range $(-\infty, 7]$

C) decreasing over $(-\infty, 7]$ and has range $(-\infty, 7]$

D) decreasing over $[7, \infty)$ and has range $(-\infty, \infty)$

E) decreasing over $(-\infty, \infty)$ and has range $(-\infty, 2]$

10. The range of the function $f(x) = -\frac{1}{2}x^2 + 6x + 17$ is

A) $[35, \infty)$

B) $(-\infty, 17]$

C) $(-\infty, 35]$

D) $[17, \infty)$

E) $[-35, 0]$

11. If the vertex of the parabola $y = -x^2 + 8x + 2c$ is a point on the x axis, then the value of c is equal to

    A) -8

    B) -32

    C) 32

    D) 64

    E) -64

12. If p and q are two integers such that $3p - q = 18$ and the product pq is minimum, then $p + q =$

    A) 6

    B) -3

    C) -6

    D) 3

    E) 1

13. The maximum of product $(3 - 2x)(x + 2)$ is

      A) 45/4

      B) 49/8

      C) 49/4

      D) 6

      E) 4

14. The maximum area of a rectangle that has perimeter 1600 meters is
   equal to

      A) 160000 square meters

      B) 240000 square meters

      C) 20000 square meters

      D) 40000 square meters

      E) 80000 square meters

15. The graph of $f(x) = -\frac{1}{2}x^2 + 6x - 16$ is completely above the x-axis on the interval

    A) $[6,8]$

    B) $(4,8)$

    C) $(4,6) \cup (6,8)$

    D) $(-\infty, 4) \cup (8, \infty)$

    E) $(-\infty, 6) \cup (8, \infty)$

16. One of the x-intercepts of the graph of the function $f(x) = 3x^2 + kx - 4$ is 4. Then the second the x-intercept is equal to:

    A) 11

    B) -11

    C) -4

    D) $-\frac{1}{3}$

    E) $\frac{1}{3}$

17. If a ball is thrown up in the air and its height h, in meters, is a function of time t, in seconds, given by $h(t) = -16t^2 + 128t + 105$, then the time it will take the ball to reach its maximum height is

A) 4 seconds

B) 1 second

C) 2 seconds

D) 8 seconds

E) 16 seconds

18. A ball is thrown vertically upward. If the height b in feet of the ball is given by the equation $h(t) = -16t^2 + 80t + 100$ where time t is in seconds, then the maximum height that the ball attains is

A) 200 feet

B) 150 feet

C) 300 feet

D) 100 feet

E) 250 feet

19. If the sum of two numbers is 106 and their product is maximum, then the difference of these numbers is

       A) 10

       B) 2

       C) 0

       D) 14

       E) 53

20. If $x = 3$ is the axis of symmetry of the parabola $f(x) = -x^2 + 2cx + c^2 + 4$ for some constant c, then the maximum value of $f(x)$ is equal to

       A) 18

       B) 3

       C) 6

       D) 13

       E) 22

21. If the slope of the line through $(2, -3)$ and the vertex of the

parabola $y = (x + m)^2 - 5$ is $3/m$, them m is

A) -2

B) -5

C) -4

D) -3

E) -6

22. The quadratic function $f(x) = -5x^2 - 6x + 2$ has axis of symmetry

as

A) $x = -\dfrac{19}{5}$

B) $y = \dfrac{19}{5}$

C) $y = -\dfrac{3}{2}$

D) $x = \dfrac{3}{4}$

E) $x = -\dfrac{3}{5}$

23. If the quadratic function $f(x) = ax^2 + bx + c$ has only one x-intercept $(2,0)$ and y-intercept $(0, -8)$, then $a + b + c =$

A)-2

24. If $(1, k)$ is the vertex of the quadratic function $f(x) = -2x^2 + mx + m + 1$, then the range of f is

A) $(-\infty, 4]$
B) $(-\infty, 1]$
C) $[4, \infty)$
D) $[7, \infty)$
E) $(-\infty, 7]$