

## 1 Section 2.4

**Exercise 1** If  $x = 3$  is the axis of symmetry of the parabola  $f(x) = -x^2 + 2cx + c^2 + 4$  for some constant  $c$ , then find the maximum value of  $f(x)$ . (ans: 13)

**Exercise 2** For the quadratic function  $y = -x^2 - 2x + 3$ . 1) find the standard form of the equation. 2) Find the vertex and axis of symmetry. 3) Find the maximum or minimum value of the function. 4) sketch the graph of the function.

**Exercise 3** If a rock is thrown upward from the ground with an initial velocity of 48 feet per second, the distance  $S$  in feet of the rock from the ground after  $t$  seconds is  $S = 48t - 16t^2$ . Find the maximum height the rock can reach.

**Exercise 4** 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. Find the time interval in seconds for which the ball will be more than 96 feet above the ground.

**Exercise 5** If  $f(x) = -x^2 + 4$ , then find the interval for which  $f$  is increasing.

**Exercise 6** The length  $L$  of a rectangular field is twice its width. Suppose that the area of the field is at least 1800 square feet. Find all possible values of  $L$ .

**Exercise 7** Find the shortest distance between the line  $y = 1$  and the vertex of the parabola  $y = x^2 - 4x + 7$ . (ans: 2)

## 2 Section 2.5

**Exercise 8** Which translations should be applied to obtain the graph of the equation  $(x + 1)^2 + (y - 2)^3 = 4$  from the graph of  $x^2 + y^3 = 4$

**Exercise 9** Which translations should be applied to obtain the graph of the equation  $5x = y^2 + 4y + 14$  from the graph of  $5x = y^2$

**Exercise 10** Which translations should be applied to obtain the graph of the equation  $f(x) = 2x^2 + 12x - 7$  from the graph of  $g(x) = 2x^2$

**Exercise 11** Which translations should be applied to obtain the graph of the equation  $g(x) = |3x + 6| + 2$  from the graph of  $f(x) = 3|x|$

**Exercise 12** What is the resulting function of shifting the graph of the equation  $y = 2x^2 + 3x - 1$  one unit to the left and 3 units upward

**Exercise 13** What is the resulting function of shifting the graph of the equation  $(x + 1)^2 + (y - 2)^3 = 1$  two units to the right and two units downward

**Exercise 14** What is the resulting function of shifting the graph of the equation  $y = x^2 + x$  two units to the right and one unit upward

**Exercise 15** *How can we obtain the graph of the equation  $|x| = -y + 2$  from the graph of  $y = |x|$*

**Exercise 16** *If the graph of the equation  $Ax^2 + By^2 + Cx + Dy + E = 0$  is obtained from  $2x^2 - 3y^2 = 6$  by means of a horizontal translation of three units the left and vertically three units upward, then find the value of  $A$ ,  $B$ ,  $C$ ,  $D$ , and  $E$ .*