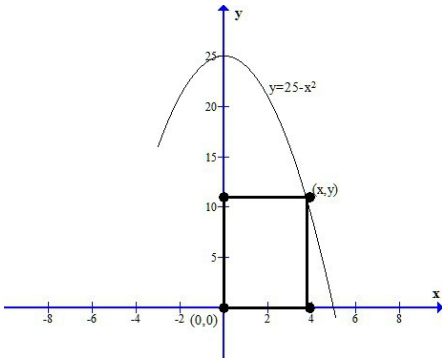
3.6 Practice Problems

1. Let $P=(x, y)$ be a point on the graph of $y=x^2-10$
   a. Express the distance from P to the origin as a function of x.
   b. What is d if $x=0$?
   c. What is d if $x=3$?
   d. Use a graphing utility to graph $d=d(x)$
   e. For what values of x is d the smallest?

2. A rectangle has one corner in quadrant I on the graph of $y=25-x^2$, another at the origin, a third on the positive y-axis, and a fourth on the positive x-axis.
   a. Express the area of the rectangle as a function of x.
   b. What is the domain of A?
   c. Graph $A=A(x)$. For what value of x is A largest?



3. A wire of length x is bent into the shape of a square.
   a. Express the perimeter p of the square as a function of x.
   b. Express the area A of the circle as a function of x

4. Two cars are approaching an intersection. One is 3 miles west of the intersection and is moving at a constant speed of 35 miles per hour. At the same time, the other car is 4 miles north of the intersection and is moving at a constant speed of 40 miles per hour.

a. Build a model that expresses the distance d between the cars as a function of time.

b. Use a graphing utility to graph $d = d(t)$. for what value of t is d the smallest.

5. An island is 3 miles from the nearest point P on a straight shoreline. A town is 9 miles down the shore from P.

a. If a person can row a boat at an average speed of 2 miles per hour and the same person can walk 4 miles per hour, build a model that expresses the time T that it takes to go from the island to the town as a function of the distance x from P to where the person lands the boat.

b. What is the domain of T?

c. How long will it take to travel from the island to town if the person lands the boat 2 miles from P?

d. How long will it take if the person lands the boat 6 miles from P?

6. An open box with a square base is to be made from a piece of cardboard 32 inches on a side by cutting out a square from each corner and turning up the sides.

a. Express the volume V of a box as a function of the length x of the side of the square cut from each corner.

b. What is the volume if a 2-inch square is cut out?

c. What is the volume if a 8-inch square is cut out?

d. Graph $V = V(x)$. For what value of x is V the largest?