

## Applications

Useful questions/steps:

- ❖ A diagram is often useful
- ❖ What quantities can you define?
- ❖ What are you being asked? Usually, express this “answer” as a function –  $f(x)$ ,  $g(x)$ ,  $A(t)$ , etc.
- ❖ What is the independent variable (input)?
- ❖ What do you know about the function? What do you know that could be helpful in defining the function?
  - You may know how the “answer” function depends on some OTHER variable(s), say  $u$ , which in turn depend on the independent variable. Answer =  $g(u)$ ,  $u=h(x)$ .
  - In that case, substitute the expression for  $h(x)$  for  $u$  in the formula  $g(u)$ . The result will give a formula for the answer in terms of  $x$ . Answer =  $f(x)$ .

P. 282-285

**2. Volume of a Cone** The volume  $V$  of a right circular cone is

$V = \frac{1}{3}\pi r^2 h$ . If the height is twice the radius, express the volume  $V$  as a function of  $r$ .

p. 283 #6.

**Demand Equation** The price  $p$ , in dollars, and the quantity  $x$  sold of a certain product obey the demand equation

$$x = -20p + 500, \quad 0 \leq p \leq 25$$

- (a) Express the revenue  $R$  as a function of  $x$ .
- (b) What is the revenue if 20 units are sold?
- (c) Graph the revenue function using a graphing utility.
- (d) What quantity  $x$  maximizes revenue? What is the maximum revenue?
- (e) What price should the company charge to maximize revenue?

p. 283 #8.

**8. Enclosing a Rectangular Field along a River** Beth has 3000 feet of fencing available to enclose a rectangular field. One side of the field lies along a river, so only three sides require fencing.

- (a) Express the area  $A$  of the rectangle as a function of  $x$ , where  $x$  is the length of the side parallel to the river.
- (b) Graph  $A = A(x)$  using a graphing utility. For what value of  $x$  is the area largest?

- 11.** Let  $P = (x, y)$  be a point on the graph of  $y = \sqrt{x}$ .
- (a) Express the distance  $d$  from  $P$  to the point  $(1, 0)$  as a function of  $x$ .
  - (b) Use a graphing utility to graph  $d = d(x)$ .
  - (c) For what values of  $x$  is  $d$  smallest?

p. 284 #22

- 22.** A wire of length  $x$  is bent into the shape of a square.
- (a) Express the perimeter of the square as a function of  $x$
  - (b) Express the area of the square as a function of  $x$ .

P. 285 #30

**Installing Cable TV** MetroMedia Cable is asked to provide service to a customer whose house is located 2 miles from the road along which the cable is buried. The nearest connection box for the cable is located 5 miles down the road (see the figure).

- (a) If the installation cost is \$10 per mile along the road and \$14 per mile off the road, express the total cost  $C$  of installation as a function of the distance  $x$  (in miles) from the connection box to the point where the cable installation turns off the road. Give the domain.
- (b) Compute the cost if  $x = 1$  mile.
- (c) Compute the cost if  $x = 3$  miles.
- (d) Graph the function  $C = C(x)$ . Use TRACE to see how the cost  $C$  varies as  $x$  changes from 0 to 5.
- (e) What value of  $x$  results in the least cost?