

## Chapter 5 (part II) Review

**Determine if the Mean Value Theorem applies to the following problems**

1)  $f(x) = x^2 + 5x$  on  $[2, 4]$

3)  $f(x) = \frac{x^2 - x}{x}$  on  $[4, 6]$

2)  $f(x) = \frac{x^2 - x}{x}$  on  $[-1, 2]$

4)  $f(x) = \ln(x - 3)$  on  $[3, 5]$

**Find the value of “x” that satisfies the M.V.T.**

5)  $f(x) = x^2 - 2x + 3$  on  $[1, 3]$

6)  $f(x) = |x|$  on  $[-3, 3]$

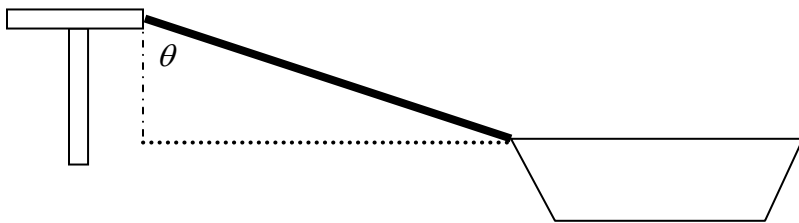
7) A gardener has 600 feet of fencing to enclose an area of land to develop. What dimensions should be used so that the gardener has the maximum area of land.

8) As a design engineer you have been contracted to design a cylindrical culinary water supply tank to hold 230,000 cubic centimeters of water as inexpensively as possible. What dimensions will minimize the surface area of the tank?

9) A  $500 \text{ ft}^3$  square-based, rectangular box is to be constructed to weigh as little as possible. What dimensions will minimize the surface area of the box?

10) A boat pulled toward a dock by a rope. The dock is 6 feet above the top of the boat. The rope is hauled in at 2 feet per second.

a) How fast is the boat approaching the dock when 10 feet of rope is out?



b) At what rate is  $\theta$  changing?

**11)** A ladder 25 ft. long leans against a vertical building. Answer the following questions given the bottom of the ladder slides away from the building horizontally at the rate of 1 ft./sec. and the top of the ladder is 8ft. from the ground.

**a)** At that instant, what is the *speed* the ladder sliding down the building?

**b)** At that instant, how fast is the angle between the ladder and the ground changing?

**12)** Sand is falling onto a conical pile at the rate of 10 cubic feet per minute. The diameter of the base of the cone is three times the height. At what rate is the height of the pile changing when it is 15 ft. high?

**13)** A rocket is shot up from the ground. The position function of the rocket is  $s(t) = -16t^2 + 40t$ , where  $t$  is measured in seconds and  $s(t)$  is in feet.

- a) Find the position of the rocket after 2 seconds.
  
  
  
  
  
  
  
  
  
  
- b) Find the instantaneous velocity of the rocket at  $t = 2$ .
  
  
  
  
  
  
  
  
  
  
- c) Find the average velocity of the rocket for the first 2 seconds.
  
  
  
  
  
  
  
  
  
  
- d) When did the rocket hit the ground?
  
  
  
  
  
  
  
  
  
  
- e) Find the speed of the rocket when it hits the ground.