

## CALCULUS I - Worksheet #22

1. A 13 ft ladder leans against a building. If the bottom slides away horizontally at  $3 \frac{\text{ft}}{\text{sec}}$ , how fast is the ladder sliding down the building when the ladder is 5 ft above the ground?
2. A water tank has the shape of an inverted cone with altitude 15 ft and base radius 5 ft. If water is pumped in at  $13 \frac{\text{ft}^3}{\text{min}}$ , how fast is the water level rising when the water is 6 ft deep?
3. A balloon is being filled with helium at the rate of 4 cubic  $\frac{\text{ft}}{\text{min}}$ . The rate, in square feet per minute, at which the surface area is increasing when the volume is  $\frac{32\delta}{3}$  cubic feet is:  
(A)  $4\delta$  (B) 2 (C) 4 (D) 1 (E)  $2\delta$
4. A circular conical reservoir has depth 20 feet and radius of the top 10 feet. Water is leaking out so that the surface is falling at the rate of  $\frac{1 \text{ ft}}{2 \text{ hr}}$ . The rate, in cubic feet per hour, at which the water is leaving the reservoir when the water is 8 feet deep is:  
(A)  $4\delta$  (B)  $8\delta$  (C)  $16\delta$  (D)  $\frac{1}{4\delta}$  (E)  $\frac{1}{8\delta}$
5. Find c for Rolle's Theorem for  $f(x) = x^3 - 12x$  on  $[0, 2\sqrt{3}]$
6. Find c for the Mean Value Theorem for  $f(x) = 3x^2 + 4x - 3$  on  $[1, 3]$ .
7. Find k so that  $f(x)$  is continuous at  $x = 3$  if  $f(x) = \frac{x^2 - 2x - 3}{x - 3}$  when  $x \neq 3$  and  $f(3) = k$ .
8. Oil from an uncapped oil well in the ocean is radiating outward in the form of a circular film on the surface of the water. If the radius of the circle is increasing at a rate of  $2 \frac{\text{in}}{\text{min}}$ , how fast is the area growing when the radius is 100 in.?
9. Find c for the Mean Value Theorem for  $f(x) = x^3 - 1$  on  $[-2, 4]$ .
10. Find c for Rolle's Theorem for  $f(x) = x^2 - 5x + 4$  on  $[1, 4]$ .