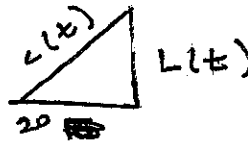
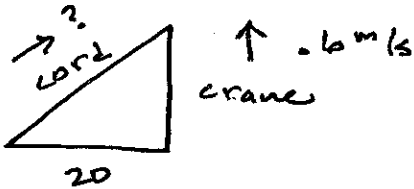


Name: _____

Quiz 9, section 3.9

due on Tuesday 3 Mar

1. (5 pts) A construction crane is lifting a load vertically at the rate 0.6 m/s. A stabilizing cord is attached tautly to the load, and is secured at a point on the ground 20 m from the base of the crane. How fast is the stabilizing cord being rolled out at the instant when the load is 15 m above the ground? Note: 'tautly' implies that the ground, cord and crane form a right triangle.

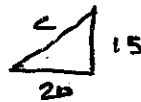


$$\frac{dL}{dt} = .6 \text{ m/s}$$

Find $\frac{dc}{dt}$ when $L = 15$

$$c^2 = L^2 + 20^2$$

$$2c \frac{dc}{dt} = 2L \frac{dL}{dt}$$

instant: when $L = 15$ 

$$c^2 = 15^2 + 20^2 = 625$$

$$c = 25$$

so

$$2 \cdot 25 \cdot \frac{dc}{dt} = 2 \cdot 15 \cdot 0.6$$

$$\frac{dc}{dt} = \frac{15 \cdot 0.6}{25} = .36 \text{ m/s}$$

2. (5 pts) Sand is being piled onto a conical heap ($V = \frac{\pi}{3} r^2 h$) with its height equal to half its radius. How fast is the gravel being dumped onto the cone (units: m^3/s) if the height is changing at the rate 0.1 m/s at the instant when the height is 4m?

① $h = \frac{1}{2} r$ ② Find $\frac{dV}{dt}$ if $\frac{dh}{dt} = 0.1$ when $h = 4$

③ keep h in eqn so use $r = 2h$

④ $V = \frac{\pi}{3} (2h)^2 h = \frac{4\pi}{3} h^3$

$$\frac{dV}{dt} = 4\pi h^2 \frac{dh}{dt}$$

instant:

$$\frac{dV}{dt} = 4\pi (4)^2 (0.1) = 20.1 \text{ m}^3/\text{s}$$