CH.2 Related Rates WS **Name :** _____ **Per.** ____

1) Find $\frac{dx}{dt}$ given $x = 5$ and $\frac{dy}{dt} = 7$ for the equation $3x^2 - 5y^3 = 35$.

2) The radius of a circle is increasing at the rate of 4 feet per minute.

a) Find the rate at which the area $\left(A = \pi r^2\right)$ is increasing when the radius is 12 feet. _____

b) Find the rate at which the circumference $\left(C = 2\pi r\right)$ is increasing at the same time. _____

3) A spherical balloon is inflated at the rate of 11 cubic feet per minute. $\left(V = \frac{4}{3}\pi r^3\right)$

a) How fast is the radius of the balloon changing at the instant the radius is 5 feet? _____

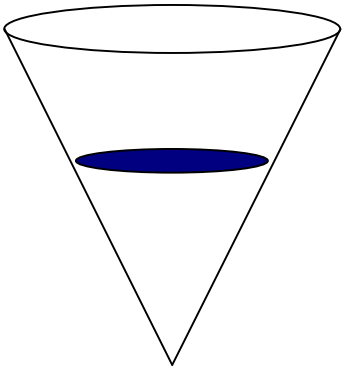
b) How fast is the surface area $\left(A = 4\pi r^2\right)$ of the balloon changing at the same time? _____

4) The height of a cylinder with a radius of 4 ft. is increasing at a rate of 2 feet per minute.
Find the rate of change of the volume of the cylinder when the height is 6 feet. $\left(V = \pi r^2 h\right)$

5) A conical tank is 20 feet across the top and 15 feet deep. If water is flowing into the tank at the rate of 9 cubic feet per minute,

a) find the rate of change of the depth of the water the instant that it is 2 feet deep. _____

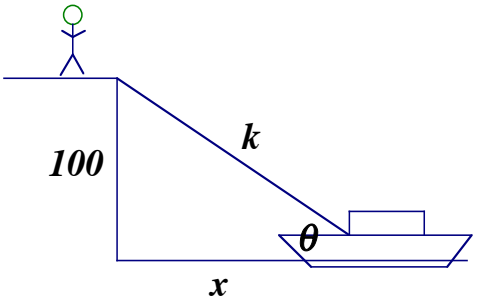
b) find the rate of change of the surface of the water at the same time. _____



6) A man standing on a 100 ft. cliff watches a boat heading away from the cliff. The boat is travelling at a rate of 88 ft/s.

a) How fast is the distance k between the boat and the man changing when the boat is 70 ft. from the cliff? _____

b) How fast is the angle θ changing at this time? _____



7) A plane is travelling toward an observer at 300 mph. The plane is flying 3 miles above the ground.

a) How fast is the distance m between the plane and the man changing when the plane is 5 miles from the man ($m = 5$)? _____

b) How fast is the angle of depression θ changing at this time? _____