Math 124 Related Rates - 2

1. Sand is poured onto a surface at the constant rate of 15 cm^3/sec, forming a conical pile whose base radius is always half its altitude. How fast is the altitude of the pile changing when the pile is 6 cm high?

2. A funnel (ie. cone) is being filled with water at the constant rate of 10 cm^3/sec. The base angle of the cone is 60°.

a) What happens to the rate at which the depth of the water changes? Does this rate increase or decrease as time goes on?

b) Find the rate at which the water level is rising when the depth of the water is 1 cm.

c) Find the rate at which the water level is rising when the depth of the water is 12 cm.

3. A lighthouse is on a small island 1 km away from the nearest point P on a straight shoreline. The light makes 5 revolutions per minute. How fast is the beam of light moving along the shoreline when it is 4 km from P?

4. As a balloon ascends vertically at a constant rate of 100 ft/min, you start to walk toward the point P directly under the balloon at the rate of 4 ft/sec. You keep your eyes fixed on the balloon as you walk. Find the rate at which you are turning your head when the balloon is 105 feet high and you are 40 feet from P. Assume your eyes are 5 feet above the ground.

5. Assume that at a location on the equator the sun rises at 6:00 AM, sets at 6:00 PM, and follows a semi-circular path. Find the rate at which the shadow of a 100 foot building is lengthening at 5:30 PM.

6. A painting in an art gallery has a height of 8 feet and is hung so that its lower edge is 6 feet above the ground. A person whose eyes are 5 feet above the ground walks directly toward the painting at the constant rate of 3 ft/sec. Find the rate at which the viewing angle is changing when the person is 10 feet from the painting. The viewing angle is the angle subtented at her eye by the painting.

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