Assignment 2

Due Jan. 29, 2016

Problem 1.

The height of a right-angled triangle is increasing at a rate of 5cm/min while its area stays constant. How fast must the base be decreasing at the moment when the height is five times the base?

Hint: use the product rule. Also, note that the fact that the triangle is right-angled is immaterial.

Problem 2.

By Pythagoras's theorem,

$$\sin^2 x + \cos^2 x = 1 \tag{1}$$

for any x.

Suppose that

$$y = \cos^4 x + \sin^4 x. \tag{2}$$

If $\dfrac{d^2x}{dt^2} = 0$, find $\dfrac{d^2y}{dt^2}$ when $\dfrac{dx}{dt} = \dfrac{1}{2}$.

Problem 3.

A man starts walking north at 4km/h from a point P. Thirty minutes later, a woman starts jogging in the same direction at 8km/h from a point 100m due east of P. Both people maintain a constant speed throughout their (endless) respective journeys.

a. How far have the man and the woman each gone 15 minutes after the woman started walking?

b. What is the distance between the two people 15 minutes after the woman started walking?

c. What is the total amount of time the woman must jog in order to overtake the man?

d. At what speed is the distance between the two people changing 15 minutes after the woman started walking?

Hint: use Pythagoras's theorem and implicit differentiation.

Note: mind the units!