4-6 day 2 Related Rates

Learning Objecves:

I can use derivatives and the process of related rates to find rates in real world situations where I know another rate.

Nov 5-11:12 AM

Ex1. A pebble is dropped into a calm pond, causing ripples in the form of concentric circles. The radius r of the outer ripple is increasing at a constant rate of 1 foot per second. When the radius is 4 feet, at what rate is the total area A of the disturbed water changing?

$A = \pi r^2$

$\frac{dA}{dt} = 2\pi r \cdot \frac{dr}{dt}$

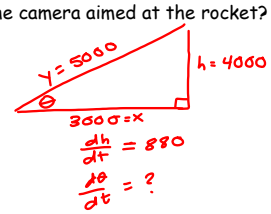
$\frac{dA}{dt} = 2\pi(4)(1)$

$\frac{dA}{dt} = 8\pi \text{ ft}^2/\text{sec}$

$\frac{dr}{dt} = 1$, $r = 4$, $\frac{dA}{dt} = ?$

Nov 5-11:13 AM

Ex. 2: A camera is mounted at a point 3000 ft from the base of a rocket launching pad. If the rocket is rising vertically at 880 ft/s when it is 4000 ft above the launching pad, how fast must the camera elevation angle change at that instant to keep the camera aimed at the rocket?



$\frac{dh}{dt} = 880$

$\frac{d\theta}{dt} = ?$

$\tan\theta = \frac{h}{3000}$

$\sec^2\theta \cdot \frac{d\theta}{dt} = \frac{h'}{3000}$

$\left(\frac{5}{3}\right)^2 \cdot \frac{d\theta}{dt} = \frac{880}{3000}$

$\frac{d\theta}{dt} = \frac{880}{3000} \cdot \left(\frac{3}{5}\right)^2$

$\frac{d\theta}{dt} = .1056 \text{ rad/sec}$

Nov 19-7:52 AM

Ex. 3: An angler has a fish at the end of his line, which is reeled in at 2 feet per second from a bridge 30 feet above the water. Assume the fish is at the surface of the water. At what speed is the fish moving through the water when the amount of line out is

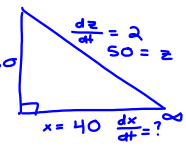
a) 50 feet?

b) 30 feet?

$x^2 + 30^2 = z^2$

$2x \cdot \frac{dx}{dt} = 2z \cdot \frac{dz}{dt}$

$\frac{dx}{dt} = 2.5 \text{ ft/sec}$



Nov 5-11:12 AM

Homework

pg 251 # 11, 13, 15, 16, 17, 19, 20, 22, 27, 33, 35, 38, 42

Nov 5-11:14 AM