Calculus 1a Related Rates

10/13/05

(1) A motorcylce traveling at constant speed of 60 km/hr passes two cacti in a line. After passing the second cactus, it makes a right turn. At what rate is the distance from the motorcycle to the cactus changing 3 minutes later? (Assume the motorcycle passes through the cacti.)

(2) A student is running to class to take a math exam. He burns 700 calories/hr running. His percent of brain power output is related to the amount of calories available for burning by the equation

$$I = \frac{c^2 - \ln(c+1)}{2000^2 + \ln(2001)}.$$

He starts the day with 2000 calories avalable. After 30 minutes, What is his brain power output level?

(3) Two weasels start at the same point and travel in opposite directions for 100 meters. Both weasels turn right and continue walking at a rate of 1 m/s. How fast is the distance between the two weasels changing after 2 seconds?

(4) A Led Zeppelin record is 12 in. in diameter, and it is rotating at $33\frac{1}{3}$ revolutions per minute. How fast is a point moving that is 1 in. from the center? How fast is a point moving on the edge of the record?

(5) The liters consumed of gasoline by a car is related to the car's velocity by the equation

$$L = 2v^2 + 10v + 6.$$

The car starts at rest and accelerates at a rate of 5 m/s^2. How fast is the gasoline being consumed after 5 seconds?

(6) If two capacitors C_1 and C_2 are connected in series, the total capacitance C is given by the equation

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2}.$$

If C_1 and C_2 are increasing at a rate of .1 and .5 respectively, how fast is C changing when $C_1 = 500$ and $C_2 = 100$?