Calculus 1510 Problem Set #4

Due dates: Nov. 28 (Wednesday) and Nov. 29 (Thursday)

1. At 1 PM car A is 40m due north of car B. At this time they both begin to move. Car A travels west at 30 m/s while car B travels east at 20 m/s. At what rate is the distance between the cars changing at 2 PM?

2. The surface area of a cube is decreasing at a rate of 48 cm^2/s when the cube has edge length = 12 cm. What is the rate of change of the volume of this cube at this moment?

3. A ladder 10 m long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a speed of 2 m/s, how fast is the angle between the top of the ladder and the wall changing when the angle is $\frac{\pi}{4}$ radians?

4. Evaluate the following indefinite integrals.

   (a) $\int \frac{x^4 - 3x^3}{6x^2} dx$

   (b) $\int \left(2e^{3x} + \frac{1}{x} + \sin x \right) dx$

   (c) $\int \sqrt{2x+3}\, dx$

5. A object moves along a line so that its velocity at time t, $0 \le t \le 6$, is

   $v(t) = t^2 - t - 6$ (measured in metres per second).

   The object starts from position x = 3 m at time t = 0.

   (a) What is the position of the object at t = 6 s?

   (b) Find the distance the object traveled from t = 0 s and t = 6 s.

   (c) State the intervals of time when the particle was speeding up? slowing down?