

Fall 2009 Math 151

Week in Review V

courtesy: David J. Manuel

(covering 3.3, 3.4)

1 Section 3.3

1. A particle moves in a line according to the function $s = f(t) = t^3 + 3t^2 - 9t + 5$, where t is in seconds and s is in feet.

- Find the velocity at time t .
- What is the position and velocity after 3 seconds?
- When is the particle at rest?
- Find the total distance traveled in the first 3 seconds.

2. Same questions as above given $s = f(t) = \frac{t}{t^2 + 4}$.

3. A trash compactor is crushing a pile of trash which remains in the shape of a cube.

- Find the average change in the volume of the cube as the length of a side changes from 50 cm to 40 cm.
- Find the rate of change in the volume of the cube when the length of a side is 50 cm.

2 Section 3.4

1. Compute the following limits:

(a) $\lim_{x \rightarrow 0} \frac{2x}{\sin 5x}$

(b) $\lim_{x \rightarrow 0} \frac{\tan 7x}{\sin 3x}$

(c) $\lim_{x \rightarrow 0} \frac{\cos x - 1}{x^2}$

2. Find and simplify the derivatives of

$$f(x) = \frac{1 - \cos x}{\sin x} \quad \text{and} \quad g(x) = \frac{\sin x}{1 + \cos x}.$$

3. Find the equation of the line tangent to the graph of $f(x) = x^2 \tan x$ at the point where $x = \frac{\pi}{4}$.

4. Find all values of a such that $0 \leq a \leq 2\pi$ and the line tangent to $f(x) = \sin^2 x + \cos x$ at $x = a$ is horizontal.

5. Given the identity $\sin 2x = 2 \sin x \cos x$, differentiate the right-hand side to obtain the derivative of $\sin 2x$.