

GEEN 1340 TEST 2 - November 13, 2007

**INSTRUCTIONS:** Books, notes, flying monkeys and electronic devices are not permitted. Write your (1) name, (2) instructor's name, and (3) recitation section on the front of your bluebook. Also make a scoring table, with places for 6 problems, plus a total score. Work all 6 **problems**. Start each problem on a **new page**. Show your work. **Box** in your answers. A correct answer with incorrect or no supporting work may receive no credit, while an incorrect answer with relevant work may receive partial credit.

1. [25points]

- State the definition of a derivative.
- Use the definition to find the derivative of  $y = \sqrt{5x+3}$
- Find the equations of the tangent and normal lines to the curve at  $x = 1$ .

2. [15points] Find the following limits:

a)  $\lim_{x \rightarrow 0} \frac{\tan 7x}{5x}$       b)  $\lim_{x \rightarrow 0} \frac{\sin x}{5x^2 + 2}$       c)  $\lim_{x \rightarrow 0} \tan\left[1 - \frac{\pi}{2} \sin\left(\frac{\pi \cos x}{6}\right) + 1\right]$

3. [18 points] If a rocket is launched and its position is represented by

$$s(t) = -16t^2 + 96t + 100$$

- Find the equations for velocity and acceleration
- When does the rocket reach the highest point?
- How high does the rocket go?
- What was the rocket's initial position?
- When does the rocket get back to its original position?
- What is the SPEED of the rocket when it hits the ground?

4. [20 points] Find  $dy/dx$  for the following, but **do not simplify**:

a)  $y = \frac{(2x-7)^5}{(x^3+4)^3}$       b)  $y = \sin(\tan(x^4 - 3x))$

c)  $x^2 + y^2 = (x-y)^2$       d)  $y = (\cos^4 5x)(x^2 - 3x)^5$

5. [7 points] Find  $dy/dx$  if  $x^3 - 5xy + 2y^2 = 8$

6. [15 points] Consider

$$f(x) = \begin{cases} 8ax - b & x \leq 1 \\ 4x^2 + b & x > 1 \end{cases}$$

What values would  $a$  and  $b$  have to assume in order for the function to be differentiable at  $x=1$ ? Justify your answer.