

Math 125 Carter Test 1 Fall 2009

General Instructions: Write your name on only the outside of your blue book. Put your test paper inside your blue book as you leave. Solve each of the following problems point values are indicated on the problems.

To make a grilled cheese sandwich, butter the outside surfaces of the bread edge-to-edge, place the buttered bread on a flat griddle or frying pan, butter side down. Take a few slices of extra-sharp cheddar cheese and place them on top of the bread (never used pre-wrapped slices), turn the griddle to 250-300° F, or the stove on medium heat and cover. When the cheese begins to melt, flip one side to close the sandwich, turn off the griddle, and then flip the entire sandwich. Slice into two triangles.

1. Use the rules for computing the limit for each of the following problems (*8 points each*).

(a)

$$\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$$

(b)

$$\lim_{h \rightarrow 0} \frac{1}{h} \left(\frac{1}{x+h} - \frac{1}{x} \right)$$

(c)

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

2. Use the rules for differentiation to compute the derivatives for the following functions (*8 points each*).

(a)

$$f(x) = 3x^2 - 6x + 5$$

(b)

$$f(x) = e^x(x + 2)$$

(c)

$$f(x) = \frac{x^2 - 2}{x^4 + 1}$$

(d)

$$f(x) = x^5 - 3x^4 + 2x^3 - 8$$

3. (*10 points*) Use the rules of differentiation to compute the equation of the line tangent to the curve $y = x^2 + x + 3$ at $a = 0$.

4. (*10 points*) Solve the inequality

$$|3x - 2| \leq 8.$$

5. (*10 points*) Give a proof that

$$\lim_{h \rightarrow 0^+} \frac{\sin(h)}{h} = 1.$$

6. (10 points) Is the function $f(x)$ given below continuous at $x = 1$? Explain.

$$f(x) = \begin{cases} x^3 + 4 & \text{if } x \leq 1 \\ 4x & \text{if } 1 < x \end{cases}$$

7. (10 points) Complete the square and sketch the graph of the parabola

$$y = 2x^2 - 8x - 13.$$