Name_____   20 September 2007

Teaching Assistant_____   Hour Test 1
Math 1501G Andrew

Instructions: 1. Closed book.
               2. Show your work and explain your answers and reasoning.
               3. Calculators may be used, but are by no means necessary. Pay particular
                  attention to instruction 2. **To receive credit, you must show your
                  work.** Unexplained answers, and answers not supported by the work
                  you show, will not receive credit.
               4. Express your answers in simplified form.

1. (25) a. Either evaluate the limit or explain why it does not exist. Anyone using
   L'Hospital's Rule will be severely punished.

   i. $\lim_{x \to 1} \left(\dfrac{x^2 - 5x + 4}{x^2 - 2x - 8} \right)$

   ii. $\lim_{x \to 4} \left(\dfrac{x^2 - 5x + 4}{x^2 - 2x - 8} \right)$

   iii. $\lim_{x \to 0} \left(\dfrac{\cos(x)\sin(2x)}{x} \right)$

   iv. $\lim_{x \to 4} \left(\dfrac{\sqrt{x + 5} - 3}{x - 4} \right)$

2. (25) a. Use the definition of the derivative to compute $f'(0)$ for
   $f(x) = |x|\sin(x)$.

   b. Compute the derivatives of

   i. $f(x) = \sqrt{\dfrac{x + 1}{x - 1}}$

   ii. $g(x) = \left(x^2 + x + 1 \right)^3$

   iii. $\Psi(x) = x^3 \sin(x)\cos(2x)$

3. (25) Find all point(s) on the graph of $f(x) = x^3 - 3x^2 + 2$ at which the tangent line
   is parallel to the line $y = 9x + 4$.

4. (25) The Ace Sand Company pumps sand from the Chattahoochee River onto a
   conveyor belt which raises it in the air and dumps it onto a conical pile. The sand
   settles in such a way that the base radius of the pile is always equal to its height, and
   the conveyor belt dumps two cubic yards of sand onto the pile each minute. At what
   rate is the height of the pile changing at the instant when the pile is 12 yards high?

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ANSWERS

1. i. 0   ii. 1/2   iii. 2   iv. 1/6

2. a. 0

    b. i. $-\left(\dfrac{x+1}{x-1}\right)^{-\frac{1}{2}}\left(\dfrac{1}{(x-1)^2}\right)$ ii. $3\left(x^2+x+1\right)^2(2x+1)$

      iii. $3x^2(\sin x)(\cos(2x))+x^3\cos x\cos(2x)-2x^3\sin x\sin(2x)$

3. (3,2) and (-1,-2)

4. $\dfrac{1}{72\pi}$ yards per minute.