Differential Calculus Test #2 Name:_____
Brewer Spring 2010

WORK 5 OF THE FOLLOWING 6 PROBLEMS AND PUT A DARK X THROUGH THE PROBLEM YOU DO NOT WANT GRADED. If you work all 6 and do not mark one out, I will probably choose to mark out whichever of your solutions is longest, so I suggest you make the choice yourself. Read each question carefully. You must show all work in order to receive full credit. Any derivative that does not exist must be accompanied by an explanation as to why it does not exist. Note that a derivative may exist for x in general and not exist for a specific x-value. Circle your final answers.

1. Find k such that the line $y = 2x$ is tangent to the graph of the function $f(x) = x^2 + kx$.

2. The volume v of a sphere with respect to its radius r is given by $v = \frac{4}{3}\pi r^3$.

a. Find the instantaneous rate of change of v when $r = 3cm$.

b. Find the average rate of change of v as r changes from 1 cm to 2 cm.

3. Find the derivative of f with respect to x.

$f(x) = 5\sin^2\left(\sqrt{3\csc(7x^2 - 2x)}\right)$

4. $f(x) = -3x\tan x$

a. Find $f'(x)$.

b. Find $f''(x)$.

5.

a. Find the derivative using the definition. (limit as $h \to 0$ or $\Delta x \to 0$)

$f(x) = 2x^3 - 4x^2 + 5x - 9$

b. Use the quotient rule to differentiate.

$f(x) = \dfrac{2x^3 - 4x^2 + 5x - 9}{5\sec x}$

6.

a. Use the alternate form of the derivative (limit as $x \to c$) to find the derivative at $x = c$ (if it exists).

$f(x) = (x + 4)^{2/3}$, $c = -4$

b. Use the product rule to differentiate.

$f(x) = \cot x\,(x + 4)^{2/3}$