Math 220 Calculus I
Professor John Maginnis

Midterm Exam 1
September 24, 2015

Your name: _____

Rec. Instr.: _____ Rec. Time: _____

Show all your work in the space provided under each question. Use the rules for derivatives except for problem 11. Please write neatly and present your answers in an organized way. You may use your one sheet of notes, but no books or calculators. This exam is worth 60 points. The chart below indicates how many points each problem is worth.

Problem	1	2	3	4	5
Points	/4	/4	/4	/4	/4
Problem	6	7	8	9	10
Points	/4	/4	/5	/5	/5
Problem	11	12	13		Total
Points	/5	/4	/8		/60

1. Find an equation of the tangent line to the curve $y = 2x^4 - 3x^3 + 5x - 7$ at the point where $x = 1$.

Evaluate the following limits.

2.

$$\lim_{x \to -2} \left(\frac{3x^2 + 5x - 2}{x^2 + 5x + 6} \right)$$

3.

$$\lim_{\theta \to 0} \left(\sin(4\theta) \cot(2\theta) \right)$$

4.

$$\lim_{x \to \infty} \left(\frac{6x^2 - 5x}{2x^2 + 3} \right)$$

5. Evaluate the right hand limit.

$$\lim_{x \to 3+} \frac{2x - 4}{9 - x^2}$$

6. Find the derivative.

$$y = \frac{x^2 - x}{x^3 + 1}$$

7. Find the second derivative y''.

$$y = x^5 e^x$$

8. Find the derivative $\frac{dz}{dx}$. Do not simplify.

$$z = \frac{x^2 e^x}{x^3 - 2}$$

9. Let $f(x) = \begin{cases} \frac{x+3}{x^2+1} & \text{if} \quad x < 1 \\ 3 & \text{if} \quad x = 1 \\ 3 - x^2 & \text{if} \quad x > 1 \end{cases}$

Determine whether $y = f(x)$ is continuous at $x = 1$ by computing limits.

10. Compute the limit.

$$\lim_{x \to 1} \left(\frac{\sqrt{x+3} - 2}{x^2 - 1} \right)$$

11. Use the definition of the derivative as a limit to find $f'(2)$ for the function $f(x) = 4x^2 - 3x + 6$.

12. Let $y = 2x^3 - 3x^2 - 2x + 1$. Explain why this function has (at least) three x-intercepts in the interval $-1 \leq x \leq 2$.

13. A ball is thrown vertically from the roof of a building, and the height of the ball above the ground t seconds later satisfies the equation $y = -16t^2+48t+64$ feet.

    (a) Find the maximum height of the ball.

    (b) Find the velocity of the ball at the instant it hits the ground.