Math 165 Midterm Exam Section: _____ Name: _____

**Part A: Pencil & Paper Only**

This part of the exam has 10 problems on 3 pages. Each problem is worth 5 points. You may NOT use a calculator on this section. You must show all work. This part of the exam will be collected after 45 minutes.

1. Find $dy/dx$ if
$$y = \frac{3x^3}{5x^2 + 2}.$$
You do not need to simplify your answer.

2. Suppose
$$g(x) = \frac{2}{x^2}$$
Find $g''(2)$. Simplify your answer.

3. If
$$y = t^3 \ln t$$
find $dy/dt$. Simplify your answer.

4. Find

$$\lim_{x \to 1^-} \frac{x^2 + 4x + 3}{x^2 - 1}$$

5. Let

$$y = \frac{3x^2 - 5x - 2}{x^2 - 4}$$

Tell the equations of all the horizontal asymptotes.

6. Let

$$y = \frac{3x^2 - 5x - 2}{x^2 - 4}$$

Tell the equations of all the vertical asymptotes.

7. Find the derivative of $4x^3 \tan^2(x)$. You do not need to simplify your answer.

8. Find the slope of the line tangent to the graph of $y = \sqrt{x^2 + 4x - 5}$ at $x = 3$. Simplify your answer.

9. Suppose $f(x) = \sin^4(3e^x + 1)$. Find $f'(x)$. You do not need to simplify your answer.

10. Let $f(x) = x^3 + 2x^2 + 1$ for $x \geq 0$. Using that $f(1) = 4$, find $(f^{-1})'(4)$.