You may keep these two pages of questions. Turn in all of your work on the colored paper. This exam has four sections. You are not allowed to use your calculator for sections I, II and III, but you will need to use your calculator on section IV. I have distributed green paper with these pages of questions. You are to use the green paper for the questions in sections I, II, and III. After you have finished these three sections, you are to turn them in and receive pink paper to use for the question in section IV. Questions # 1 to 9 are worth 6 points each. Questons # 10, 11, and 13 are worth 10 points each. Question # 12 is worth 16 points.

I. Find values for the following limits.

1. \( \lim_{x \to 2} (3^x + x^3) \)
2. \( \lim_{x \to 3} \frac{x^2 - 8x + 15}{4x^2 - 11x - 3} \)
3. \( \lim_{x \to \infty} \frac{5x^3 + x - 8}{3x^3 - 4x^2 + 19} \)
4. \( \lim_{x \to 2^+} f(x) \) if \( f(x) = \begin{cases} x + 4 & \text{if } x < 2 \\ 2 & \text{if } x = 2 \\ x - 5 & \text{if } x > 2 \end{cases} \)

II. Derivatives.
5. Find \( f'(x) \) if \( f(x) = 4x^3 - 7x^2 + 5x - 8 \).
6. Find \( \frac{dy}{dx} \) if \( y = \sqrt[3]{x} \).
7. Find \( \frac{ds}{dt} \) if \( s = t^3e^{4t} \).
8. Find \( \frac{dy}{dx} \) if \( y = \ln(x^2 + 7x + 12) \).
9. Find \( f'(x) \) and simplify if \( f(x) = \frac{x^2 + 3x - 1}{x^2 + 5x + 7} \).

III.
10. Find an equation for the straight line which is tangent to the curve \( y = \sqrt{4x + 5} \) at the point \((1, 3)\). You may and should use theorems about derivatives on this question.
11. If the demand function is given by \( x = 20 + 3p^{-2} \), find the elasticity \( E \) as a function of \( p \) and simplify.
12. (a) State the definition for the derivative function \( f'(x) \) of a function \( f(x) \).
   (b) Use the definition of \( f'(x) \) (rather than using theorems) to find \( f'(x) \) if \( f(x) = 5x^2 - 3x - 4 \). SHOW YOUR WORK!
IV. This last problem does require a calculator. Do **NOT** do this problem on the green paper. Turn in sections I, II and III and receive the pink paper that you are required to use for this calculator problem. I have reprinted this page for you on the pink paper.

(13) Let \( f(x) = \frac{\sqrt{x^2 + 16} - 5}{2^x - 8} \)

(a) Use your calculator to complete the following table of values for \( f(x) \).

(b) Use your table from part (a) to approximate the following limit.

\[
\lim_{x \to 3} \frac{\sqrt{x^2 + 16} - 5}{2^x - 8}
\]