NAME:_____

This exam should have 4 pages; please check that it does.

(1) Find the **second derivative** of $y = x^4 + 2x + \dfrac{1}{x}$.

(2) If $x^2 + xy + 3y^2 = 5$, find $\dfrac{dy}{dx}$.

(3) The **demand function** for a certain product is $p = f(x) = 35 - 0.001x$. Write down the formula for the revenue function, $R(x)$.

(4) A 15ft ladder is propped against a wall. The base of the ladder is sliding away from the wall at a steady speed of 3 ft/sec. How fast is the top of the ladder falling when the base is 9 ft from the wall?

(5) Let $f(x) = x^3 - 6x^2 + 7$.

(a) Find the **critical numbers** of $f(x)$.

(b) Find the intervals where $f(x)$ is **increasing**, and where it is **decreasing**.

(6) Use the **First Derivative Test** to find the relative extrema of $f(x) = x^4 + 4x^3 + 1$.

(7) Find the **absolute extrema** of $f(x) = x^2 - 6x + 5$ on the closed interval $[1, 6]$.

(8) Find the intervals where $f(x) = x^4 - 2x^3 - 12x^2 + 1$ is **concave up** and where it is **concave down**.

Find the **points of inflection** of this function.

(9) Use the **Second Derivative Test** to identify the relative extrema of $x^3 + 3x^2 - 9x + 2$.

(10) Suppose you want to enclose a rectangular area of 10,000 square meters. Along an existing road, fencing material costs \$6 per meter, and along the other three sides fencing material costs \$3 per meter. What are the dimensions which minimize the total cost?