

Name: _____

Directions: Complete all question and **show all applicable work.** Partial credit will be given.

1.) [30 pts.] Calculate the following limits:

a.) $\lim_{x \rightarrow \infty} \frac{e^x}{x}$

b.) $\lim_{x \rightarrow 0^+} x \ln(x)$

c.) $\lim_{x \rightarrow \infty} (x)^{\frac{1}{x}}$

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2.) [14 pts.] A 10 foot ladder is sliding down a wall at 3 feet per second. How fast is the ladder's base sliding away from the wall when the base is 6 feet from the wall? Be sure to draw a diagram.

3.) [14 pts.] A 1200-foot fence is to be installed in a field adjacent to a straight river. The fence is to be built in a rectangular shape. What dimensions will maximize the area of the fenced in region? Hint: Draw a figure and use both the area and perimeter formulas.

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4.) [14 pts.] Find of Given the function $f(x) = x^4 - 2x^2 - 2$ on the interval $[-2, 2]$. (Note: You must show your work to receive credit.)

a.) Label each of the critical points of $f(x)$ as a local maximum, local minimum or undetermined.

b.) Find the intervals of convexity and points of inflection.

c.) Graph the function showing the above properties.

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5.) [14 pts.] Find the antiderivative of the following functions:

a.) $f(x) = 3x^2 - 5$

b.) $f(x) = \cos x$

6.) [14 pts.] Find $f(x)$ given that $f'(x) = \sec^2 x + e^x + 2$ and $f(0) = 5$.