

Name (20 pts): _____

Show all your work (excluding arithmetic) for full credit.

1. (25 pts) Find the specified derivatives.

$$\frac{d}{dx} \ln x$$

$$\frac{d}{dx} (e^{3x} - 3e^x + 3x^e)$$

$$\frac{d}{dx} (e^x \ln x)$$

$$\frac{d}{dx} \frac{e^x}{\sqrt{x}}$$

2. (25 pts) Find all critical numbers of

$$f(x) = -x^2 e^{-8x^4}$$

3. (25 pts) At each of the indicated x -values for the function $f(x)$ pictured below, determine whether each of $f(x)$, $f'(x)$, and $f''(x)$ is positive, negative, undefined, or zero.

x	$f(x)$	$f'(x)$	$f''(x)$
-4			
-2			
0			
2			
4			

4. (25 pts) Find all inflection points of

$$f(x) = \ln(x^2 + 1)$$

5. (50 pts) Graph by $f(x) = 3x^5 - 20x^4$ by hand, including zeros, asymptotes, local extrema, inflection points, intervals of increase/decrease, and concavity.

6. (50 pts) A temporary shelter is to be constructed by leaning logs against a vertical cliff face. If the logs are 6 feet long, determine the height and width of the shelter that yield the largest possible cross-sectional area.