

Name (20 pts): _____

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

1. (20 pts) Find
- y'
- if

$$e^{xy} = (xy)^e$$

2. (20 pts) Find the specified derivatives

$$\frac{d}{dx} e^{x^3 + \sqrt{x}}$$

$$\frac{d}{dx} \ln(\sqrt{x})$$

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

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

3. (20 pts) Find all inflection points of

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

4. (20 pts) Find all local extrema of

$$f(x) = \ln(-x^2 + 7x - 12)$$

5. (20 pts) Draw a graph satisfying the following conditions:

- $f''(x) < 0$ for $x < 0$
- $f''(x) > 0$ for $x > 0$
- $f''(x) = 0$ for $x = 0$
- $f'(x) > 0$ for $x < -1$ and $x > 1$
- $f'(x) < 0$ for $-1 < x < 1$
- $f'(x) = 0$ for $x = \pm 1$

6. (50 pts) Graph $f(x) = e^{-2x^2-8x}$ by hand. Show all intercepts, asymptotes, local extrema, inflection points, intervals of increase/decrease and concavity.

7. (50 pts) Find the largest possible area of a rectangle contained in a circle of radius 10.