

Name: _____

Each problem is worth 10 points; you must show all your work (excluding arithmetic) for full credit.

1. Find the derivatives:

(a) $\frac{d}{dx} [10^x]$

(b) $\frac{d}{dx} [\log_2 x]$

(c) $\frac{d}{dx} [e^{(\sqrt{x})}]$

(d) $\frac{d}{dx} \left[\ln \left(\frac{1}{\sqrt[3]{x}} + x \right) \right]$

2. Find the derivative:

$$\frac{d}{dx} \left[e^{\frac{\sqrt{5-x^2}}{13-x^3}} \right]$$

3. Find all local extrema and inflection points of

$$f(x) = \frac{(x + 7)^2}{(x + 3)^2}$$

4. Graph the function $f(x)$ from problem 3 by hand. Show all intercepts, asymptotes, local extrema, inflection points, intervals of increase/decrease, and intervals of concavity.

5. Find the minimum vertical distance between the graphs of $f(x) = 2x^2$ and $g(x) = \ln x$.

6. Find the equation of the tangent line to the ellipse

$$\left(\frac{x-3}{10}\right)^2 + \left(\frac{y+5}{5}\right)^2 = 1$$

at $(x, y) = (9, -1)$.