

1. Let $f(x) = x^4 - 8x^2 + 7$.

(a) Find the derivative of f .

(b) Find any local minima/maxima of f .

(c) Using your work above, write down any intervals where $f(x)$ is increasing.

(d) Find any inflection points of f .

(e) Using your work above, write down any intervals where $f(x)$ is concave up.

2. Find the equation of the line tangent to $h(x) = e^x (x + 1)^{3.5}$ at $x = 0$. Show all of your work.

3. Compute the following derivatives. Circle your final answers.

(a) $\frac{d}{dx} \frac{x^2}{\ln(x)}$

(b) $\frac{d}{dx} \sqrt[3]{3x^4 - 7x + \frac{1}{x}}$

(c) $\frac{d}{dy} e^y \ln(y + 1)$

4. *Momo & Co* sells their products for \$25 each, and the manufacturing costs (in thousands of dollars) are modeled by the following function.

$$C(q) = -q^3 + 12q^2 - 20q + 5$$

Where q is the number of units produced (in thousands).

- (a) What quantity q results in maximum profit, and what is the maximum profit? Show all of your work.

- (b) For each of the following quantities q , determine whether *Momo & Co* should increase or decrease production levels in order to maximize profit. Unjustified answers will not receive credit.

i. $q = 1$

ii. $q = 7$