

YOUR NAME: _____

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Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Compute the following derivatives:

(a) $\left[\frac{x^3 + 5x}{x^2 + 4} \right]' =$

(b) $[(3x + 1)^4(7x - 3)^5]' =$

2. Find an equation for the tangent line to the graph of

$$f(x) = \sqrt{x^5} - \frac{6}{\sqrt{x}} + 1$$

at $x = 4$.

3. After t hours a car is at distance $s(t) = 60t + \frac{100}{t+3}$ miles from its starting point. Find the velocity of the car after 2 hours.

4. A company's cost function is $C(x) = \sqrt[3]{7x^3 + 8000}$ dollars where x is the number of units produced.

(a) Find the marginal cost function $MC(x)$.

(b) Calculate $MC(20)$, provide units and interpret the answer.

5. Consider the function

$$f(x) = -x^4 - 4x^3 - 4x^2 + 1.$$

(a) Find $f'(x)$.

(b) Find the critical points.

(c) Create the sign table of the first derivative (as we did in class).

(d) Summarize your conclusions about intervals of monotonicity (where function is increasing or decreasing) and relative extrema (relative minima and relative maxima).