

PRACTICE PROBLEMS FOR 2200 MIDTERM EXAM 2

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- 1) Give the definition of the derivative of a function f at the point x .
- 2) State the Extreme Value Theorem.¹
- 3) In each of the following problems, find $\frac{dy}{dx}$.
 - a) $y = (x^2 + 4x)^{5/2}$.
 - b) $y = \frac{2+3x}{e^{4x}}$.
 - c) $y = \sin(2 \cos 3x)$.
 - d) $y = \ln(xe^{x^2})$.
 - e) $y = \cot x$.
 - f) $y = (\cos x)(\ln x)e^x$.
- 4) In each of the following problems, find $\frac{dy}{dx}$ by logarithmic differentiation.
 - a) $y = \left(\frac{(x+1)(x+2)}{(x^2+1)(x^2+2)} \right)^{\frac{1}{3}}$.
 - b) $y = x^{(e^x)}$.
- 5) A rocket is launched vertically upward from a point 3 miles west of an observer on the ground. What is the speed of the rocket when the angle of elevation (from the horizontal) of the observer's line of sight to the rocket is 47 degrees and is increasing at 3.5 degrees per second? (Hint: remember to convert from degrees to radians: $180^\circ = \pi$ radians.)
- 6) Gravel is being dumped from a conveyor belt at a rate of 30 cubic feet per minute. It forms a pile in the shape of a right circular cone whose base diameter and height are always the same. How fast is the height of the pile increasing when the pile is 18 feet high? Recall that the volume of a right circular cone with height h and base radius r is $\frac{1}{3}\pi r^2 h$.
- 7) Let $f(x) = \frac{4x}{x^2+1}$ be defined on the interval $[-4, 0]$. Find the absolute maximum and absolute minimum values of f .
- 8) Let $g(x) = |x^2 - 5|$ be defined on $[-8, 9]$. Find the absolute maximum and minimum values of g .

¹Your textbook calls it the "Maximum and Minimum Value Property".