

Second Exam**DO NOT WRITE ON THIS PROBLEM SHEET**

Nothing written here will be read or graded.
WRITE YOUR ANSWERS IN AN EXAM BOOKLET

Answers without justification will receive little to no credit. You do not need to simplify your answers unless you are specifically asked to do so.

(15 pts) **1.** Find the derivative of each function. Do not simplify your answers.

(a) $\log_5(6 + \sin x)$

(b) $x^{\sin x}$

(c) $\tan^{-1}(e^{1-x})$

(20 pts) **2.** Find a point (x, y) on the graph of $y = \frac{x^2}{6} + 4$ nearest the point $P = (0, 13)$.

Hint: Find the minimum value of the square of the distance between (x, y) and P .

(20 pts) **3.** Consider the equation $x^2 + xy + 2y^2 = 4$.

(a) Use implicit differentiation to compute the derivative $\frac{dy}{dx}$

(b) Find an equation for the tangent line to the curve at $(1, 1)$.

(15 pts) **4.**(a) Verify that $f(x) = x\sqrt{x+6}$ satisfies the hypotheses of Rolle's Theorem on the interval $[-6, 0]$.

(b) Find all numbers c that satisfy the conclusion of Rolle's Theorem.

(30 pts) **5.** Consider the function $f(x) = x^4 - 2x^2$.

(a) Find the intervals on which f is increasing or decreasing.

(b) Find the intervals on which f is concave up or concave down.

(c) Find the local extrema of f . Which, if any, are absolute extrema?

Hand in this problem sheet along with your exam booklet!