

Name: _____

Student ID: _____

Instructions. Write your answers in the spaces provided on this exam. You may NOT use a calculator. This exam is closed book and closed notes.

- (1) Find the local extreme values of these functions. If there are none, explain why.
- (a) $f(x) = x^3 - x^2$

(b) $g(x) = x^3 - 2x^2 + 3x - 4$

(c) $h(x) = x^2 \ln x$ for $x > 0$.

- (2) On what interval is the function $p(x) = x^4 - 3x^2 + x + 1$ concave down?

- (3) Amy sells amulets. It costs \$1 apiece to make them. If she charges \$2 per amulet, she can sell 50 per day. At a price of \$3 apiece, she sells 40 per day. What price yields the maximum profit?

- (4) Now in Antigua, Steve and Arlene run a small-scale Ponzi scheme. After t weeks of operation, they have $10 \ln t$ customers who have invested \$10 each. Unfortunately, after t weeks they have paid out $\$2t^2$ to investors. After how many weeks should they leave there to maximize their profit?

- (5) Find the partial derivatives.

(a) $v = x^2 - 4xy^2 + 4y^4$

(b) $w = s^2t + \frac{s}{t}$

(6) Find the tangent plane to the surface $z = x^2 \ln y$ at the point $(3, 2)$.

(7) Find the minimum value of $z = 2x^2 - 4x + y^2 - 4xy + 5$.

(8) What is the Ides of March, and what is its significance?