

Math 208, Section 3

(Old!) Exam 1

Show all work. How you get your answer is just as important, if not more important, than the answer itself. If you think it, write it!

1. (20 pts.) Find the equation of the plane in 3-space which passes through the three points

$$(1, -1, 2), (1, 0, 1), \text{ and } (-2, 3, 5)$$

Does the point $(1, 2, 9)$ lie on this plane??

2. (20 pts.) Find the partial derivatives of the following functions:

(a) $f(x, y, z) = x^2y^7 - 3yz^3 + \cos(x - y)$

(b) $g(x, y) = \frac{xy - 3y + 2}{(x + y)^2 - y^3}$

3. (20 pts.) Find the equation of the tangent plane to the graph of the function

$$z = g(u, v) = 3u^2 - uv^2 + v^5$$

at the point $(2, 1, 11)$.

4. (20 pts.) Sketch the level curves of the function

$$z = f(x, y) = xy - 2x$$

for z -values 0, 1, 2, and -1. (Hint: solve for y ...) Be sure to label everything appropriately.

5. Find the derivatives of the function

$$f(x, y, z) = x^2z - xy^3 + 2yz^2$$

at the point $(1, 0, -1)$, in the directions of the vectors

$$\vec{v} = (1, 1, 2) \quad \text{and} \quad \vec{w} = (2, -1, 1)$$

In what direction is the function f **decreasing** the fastest, at the point $(1, 0, -1)$??

6. (20 pts.) If

$$f(x, y) = x^2y + 3xy - xy^3,$$

where

$$x = x(t) = t - \sqrt{t^2 + 3} \quad \text{and} \quad y = y(t) = t^2 + 1,$$

use the Chain rule to find $\frac{df}{dt}$ when $t = 1$.