

UNIT 3: HOME WORK I – PARTIAL DERIVATIVES

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*Textbook: Multivariable Calculus:
Concepts and Contexts*, Fourth Edition
by James Stewart

1 Functions of several variables

Exercises 11.1 (from the textbook)

3, 5, 6, 8, 19, 20, 27, 28, 41, 42

I Evaluating a Function. Find and simplify the function values.

1. $f(x, y) = 2x + y^2$

(a) $\frac{f(x+\Delta x, y) - f(x, y)}{\Delta x}$

(b) $\frac{f(x, y+\Delta y) - f(x, y)}{\Delta y}$

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

(a) $\frac{f(x+\Delta x, y) - f(x, y)}{\Delta x}$

(b) $\frac{f(x,y+\Delta y)-f(x,y)}{\Delta y}$

I Find the domain and range of the function.

1. $f(x, y) = x^2 + y^2$
2. $f(x, y) = e^{xy}$
3. $g(x, y) = x\sqrt{y}$
4. $g(x, y) = \frac{y}{\sqrt{x}}$
5. $z = \frac{x+y}{xy}$
6. $z = \frac{xy}{x-y}$
7. $f(x, y) = \sqrt{4 - x^2 - y^2}$
8. $f(x, y) = \sqrt{4 - x^2 - 4y^2}$
9. $f(x, y) = \ln(4 - x - y)$
10. $f(x, y) = \ln(xy - 6)$

II Sketch the surface given by the function.

1. $f(x, y) = 4$
2. $f(x, y) = 6 - 2x - 3y$
3. $f(x, y) = y^2$
4. $g(x, y) = \frac{1}{2}y$
5. $z = -x^2 - y^2$
6. $z = \frac{1}{2}\sqrt{x^2 + y^2}$

$$7. \quad f(x, y) = e^{-x}$$

II Sketching a Contour Map Describe the level curves of the function. Sketch a contour map of the surface using level curves for the given -values.

1. $z = x + y, \quad c = -1, 0, 2, 4$
2. $z = 6 - 2x - 3y, \quad c = 0, 2, 4, 6, 8, 10$
3. $z = x^2 + 4y^2, \quad c = 0, 1, 2, 3, 4$
4. $f(x, y) = \sqrt{9 - x^2 - y^2}, \quad c = 0, 1, 2, 3$
5. $f(x, y) = xy, \quad c = \pm 1, \pm 2, \dots, \pm 6$
6. $f(x, y) = e^{xy/2}, \quad c = 2, 3, 4, 1/2, 1/3, 1/4$