

Math 2112

Worksheet I

Exercise 1. Consider the cube determined by the planes $x = 2$, $x = 6$; $y = 5$, $y = 9$; and $z = -1$, $z = 3$.

- (1) Give the coordinates of the eight vertices of the cube.
- (2) Give the coordinates of the center of the cube.
- (3) Find an equation of the largest sphere contained in the cube.

Exercise 2. (Page 575, Problem 20) By setting one variable constant, find a plane that intersects the graph of $z = 4x^2 - y^2 + 1$ in a:

- (1) Parabola opening upward
- (2) Parabola opening downward
- (3) Pair of intersecting straight lines.

Exercise 3. Draw the contour diagram for the function $f(x, y)$ where the function f is defined as:

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

Exercise 4.

- (1) Draw a contour diagram for $f(x, y) = 2x + 5y + 1$.
- (2) In general, describe the contour diagram of the linear function $L(x, y) := c + mx + ny$, where c, m, n are constants and $n \neq 0$.
- (3) For all x and y , show that $f(x + n, y - m) = f(x, y)$.
- (4) Explain the relation between parts (2) and (3).

Exercise 5. Find the linear function $z = c + mx + ny$ whose graph intersects the xy plane in the line $y = 3x + 4$ and contains the point $(0, 0, 5)$.

Exercise 6.

- (1) Find the equation of the linear function whose graph intersects the yz -plane in the line $z = 2y - 4$ and intersects the xz -plane in the line $z = x - 4$.
- (2) Find the equation of the linear function whose graph intersects the yz -plane in the line $z = 2y - 4$ and intersects the xy -plane in the line $y = 2 - x$.