

---

**Instructions:** Write complete legible solutions to the following problems in the space provided. Be sure to supply all the necessary steps that lead to your answers.

1. A company makes three sizes of cardboard boxes: small, medium, and large. It costs \$2.50 to make a small box, \$4.0 for a medium box, and \$4.50 for a large box. Fixed costs are \$8000.

a. Express the cost of making  $x$  small boxes,  $y$  medium boxes, and  $z$  large boxes as a function of three variables:  $c = f(x, y, z)$

b. Find  $f(3000, 4000, 5000)$  and interpret it.

c. What is the domain of  $f$ ?

2. Let  $F(x, y) = 1 - \sqrt{4 - y^2}$  and  $g(x, y) = \frac{\sqrt{y - x^2}}{1 - x^2}$

a. Find and sketch the domain of  $f$ .

b. Find and sketch the domain of  $g$

2. Sketch the graph of the function

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

3. Draw a contour map of the function showing several level curves.

$$f(x, y) = y - 3\ln(x)$$

4. Describe the level surfaces of the function.

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

5. Describe traces of the surface parallel to the three standard planes and sketch the graph.

$$f(x, y) = \sqrt{3x^2 + y^2}$$