

**Math 142 Week In Review**  
**Problem Set #11 (8.1 – 8.3)**  
**Instructor: Jenn Whitfield**

**Section 8.1**

1. Given  $S(x, y) = 5x^2y^3$ , find  $S(4, 2)$ .
2. A company produces two models of a surfboard: a standard model and a competition model. If the standard model is produced at a variable cost of \$80 each and the competition model at a variable cost of \$90 each, and if the total fixed costs per month are \$2,000.
  - a) If  $x$  is the number of standard model surfboards, and  $y$  the number of competition model surfboards, find the monthly cost function  $C(x, y)$ .
  - b) Find and interpret  $C(10, 20)$
3. A supermarket sells asparagus at \$ $a$  per pound and broccoli at \$ $b$  per pound. The daily demand equations for asparagus and broccoli are given below, respectively (in pounds).

$$x = 199 - 4a + 5b$$

$$y = 283 + 2a - 3b$$

Find the daily revenue function  $R(a, b)$  and evaluate  $R(2, 3)$ .

4. The Cobb-Douglas production function for a bicycle company is given by  $f(x, y) = 11x^{0.5}y^{0.5}$ , where  $x$  is the utilization of labor and  $y$  is the utilization of capital. If the company uses 1,217 units of labor and 1,710 units of capital, how many bicycles will be produced?

5. For the function  $f(x, y) = 7x^2 + 3y^2$ , find  $\frac{f(x+h, y) - f(x, y)}{h}$ .

6. Let  $f(x, y) = xy + 6x - 8y - 63$ . Find all values of  $x$  such that  $f(x, x) = 0$ .

**Section 8.2**

7. Find  $f_x(x, y)$  if  $f(x, y) = -3x^2 + 5xy + 7y^2$ .
8. Find  $f_{yx}(x, y)$  if  $f(x, y) = 9x^5y^6 - 3x^4y^3$ .
9. Find  $f_{xy}(x, y)$  if  $f(x, y) = (x^3 + y^5)^6$ .
10. Find  $S_y(-1, 1)$  if  $S(x, y) = x^3 \ln(y) + 5y^4e^x$ .
11. For  $f(x, y) = y^8e^{xy^3}$ , find  $f_x(x, y)$  and  $f_y(x, y)$ .
12. The productivity of a certain country with the utilization of  $x$  units of labor and  $y$  units of capital is given approximately by the function  $f(x, y) = 100x^{0.62}y^{0.38}$ .
  - a) Find  $f_x(x, y)$  and  $f_y(x, y)$ .
  - b) If the country is now using 500 units of labor and 200 units of capital, find the marginal productivity of labor and the marginal productivity of capital.
  - c) If the country is using 500 units of labor and 200 units of capital, for the greatest increase in the country's productivity, should the government encourage increased use of labor or increased use of capital?

**Section 8.3**

13. Find all the local extrema for  $f(x, y) = x^2 + xy + y^2 + 4x - 7y + 4$ .
14. Find all the local extrema for  $f(x, y) = x^2 - 4xy + y^2 + 12y + 1$ .
15. Find all the local extrema for  $f(x, y) = x^3 - 12xy + y^3$ .
16. A company produces two types of solar panels per year:  $x$  thousand of type A and  $y$  thousand of type B. The revenue and cost equations, in millions of dollars, for the year are given as follows:

$$R(x, y) = 5x + 6y$$

$$C(x, y) = x^2 - 4xy + 6y^2 + 21x - 54y - 2$$

Determine how much of each type of solar panel should be produced per year to maximize profit,

17. A delivery company requires that any rectangular package delivered must have a length plus girth (distance around) totaling no more than 114 inches. Find the dimensions of this package with maximum volume that can be sent.

