

Business Calculus, Summer 2004

Homework #5

Due: Tuesday, August 3rd, 2004 by end of class

1. Find the partial derivatives of

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

(b) $g(x, y) = 17x^{2/3}y^{-1/6} + x^{5/4}$

2. A fencing manufacturer produces two grades of fence. His profit function is

$$P(x, y) = -700 + 0.5x + 0.3y - 0.0004xy$$

where x and y are the number of yards of heavy-duty fencing and standard fencing sold per week. Suppose that currently the production level is $x = 400$ and $y = 4000$. By calculating $\frac{\partial P}{\partial x}$ and $\frac{\partial P}{\partial y}$ at this production level, tell me how he should change his production (i.e. should he increase one and decrease the other, etc.).

3. Find all second partial derivatives of

(a) $g(x, y) = (x^3 + 3xy^2 + y)e^{xy}$

(b) $h(x, y) = \frac{1+\ln x}{1+y}$

4. Find all critical points and test for local maxima and minima using the second derivative test (page 364):

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

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

5. A rectangular box without a top is to contain 108 cubic feet. The material for the base costs \$8 per square foot but the material for the sides only costs \$1 per square foot. Find the height, width, and length that yield the cheapest box.

6. A furniture store has found that its earnings can be predicted by the formula

$$E(x, y) = -55,700 + 250y + 200x + xy - 0.5y^2 - 2x^2$$

where x is its investment in inventory and y is how much it spends on advertising. Find the combination of inventory and advertising spending that maximizes the earnings.