

Section 10.2/ Homework

For problems 1-4, locate any relative extrema or saddle points.

1) $f(x, y) = x^2 + y^2 - 6x + 4y + 2$

2) $f(x, y) = x^2 + y^2 + xy - 6y + 1$

3) $f(x, y) = \frac{4}{3}x^3 - y^2 - 4x^2 + 2y - 1$

4) $f(x, y) = 2y^3 - 6y^2 - 18y + 2x^2 - 4x + 12$

5) New Jeans, a specialty blue jeans manufacturer, produces two types of blue jeans each day, x pairs of straight leg and y pairs of wide leg. The daily profit function, in dollars, is given by

$$P(x, y) = 78x + 3xy - 3x^2 - y^2 - 2y$$

a) How many straight leg jeans and how many wide leg jeans should be produced and sold each day to maximize profit?

b) What is the maximum profit?

6) The Wokon Company produces two types of woks each day, x number of regular-sized and y number of jumbo-sized. The daily profit from the sale of x number of regular-sized woks and y number of jumbo-sized woks is given by $P(x, y) = -0.3y^3 - 0.2x^2 + 6xy - 2$ hundred dollars.

a) How many of each type of woks should be sold each day to maximize profit?

b) What is the maximum profit?

7) A T-shirt company carries two competing shirts, one endorsed by Michael Jordan and the other by Shaquille O'Neal. The owner of the store can obtain both types at a cost of \$2 per shirt and estimates that if Jordan shirts are sold for x dollars apiece and O'Neal shirts for y dollars apiece, consumers will buy approximately $40 - 50x + 40y$ Jordan shirts and $20 + 60x - 70y$ O'Neal shirts each day. How should the owner price the shirts in order to generate the largest possible profit?

8) The telephone company is planning to introduce two new types of executive communications systems that it hopes to sell to its largest commercial customers. It is estimated that if the first type of system is priced at x hundred dollars per system and the second type at y hundred dollars per system, approximately $40 - 8x + 5y$ consumers will buy the first type and $50 + 9x - 7y$ will buy the second type. If the cost of manufacturing the first type is \$1,000 per system and the cost of manufacturing the second type is \$3000 per system, how should the telephone company price the systems to generate the largest possible profit? (Warning: pay attention to units such as the italicized words)

Answers:

1) (3, -2) is a relative minimum

2) (-2, 4) is a relative minimum

3) (0, 1) is a relative maximum and (2, 1) is a saddle point

4) (1, 3) is a relative minimum and (1, -1) is a saddle point

5a) 50 straight leg jeans and 74 wide leg jeans 5b) \$1876

6a) 1500 regular woks and 100 jumbo woks 6b) \$14,999,800

7) \$2.70 for Jordan shirts and \$2.50 for O'Neal shirts

8) \$30 for the first type and \$45 for the second type