

## MA122 Practice Problem Set 9

1. Maximize  $f(x, y) = 25 - x^2 - y^2$ , subject to  $2x + y = 10$ .  
Answer: 5 at (4,2)

2. The Cobb-Douglas production function for a product is given by

$$N(x, y) = 10x^{0.6}y^{0.4}$$

where  $x$  is the unit of labor and  $y$  is the unit of capital. Each unit of labor costs 30 dollars and each unit of capital costs 60 dollars. If the budget is 300,000 dollars. what is the maximum number of products that can be produced.

Answer: 38,666 at (6000, 2000)

3. Find the extrema of  $f(x, y, z) = 2x + 4y + 4z$ , subject to  $x^2 + y^2 + z^2 = 9$ .  
Answer: the maximum of  $f$  is 18, occurs at (1, 2, 2); the minimum of  $f$  is -18, occurs at (-1, -2, -2).
4. Find the least squares **quadratic** that best fits the data.

$x$	$y$
-1	-2
0	1
1	2
2	0

Answer:  $y = -1.25x^2 + 1.95x + 1.15$

5. Your market research department has found the following relationship between the number  $y$  of cans of nuts purchased per month (in thousands) at  $x$  dollars per can.

$x$	$y$
4	4.2
4.5	3.5
5	2.7
5.5	1.5
6	0.7

Find a demand equation using the method of linear least squares.

Answer:  $y = -1.8x + 11.52$