

LESSON 5-2 MORE MAX/MIN APPLICATIONS

Example: The sum of two nonnegative numbers is 30. Find both numbers if the sum (of twice the first plus the square of the second) is a maximum.

① $x = \text{first number}$
 $y = \text{second number}$

② $S = 2x + y^2$

③ $S = 2x + (30 - x)^2$

$S = 2x + 900 - 60x + x^2$

$S = x^2 - 58x + 900$

④ $0 \leq x \leq 30$

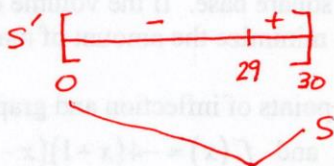
⑤ $S' = 2x - 58$

$2x - 58 = 0$

$2x = 58 \rightarrow x = 29$

③ $x + y = 30$

$y = 30 - x \leftarrow \text{Domain from here}$



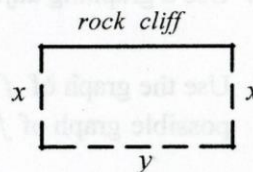
$S(0) = 2(0) + (30 - 0)^2 = 900$

$S(30) = 2(30) + (30 - 30)^2 = 60$

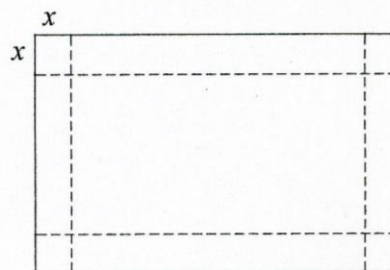
$x = 0$
 $y = 30 - 0 = 30$

ASSIGNMENT 3-8

- The product of two positive numbers is 300. Find the two numbers so that the sum of the first plus three times the second is as small as possible.
- The sum of two nonnegative numbers is 25. Find the two numbers so that the sum of the first plus the square of the second is a minimum.
- The sum of two nonnegative numbers is 25. Find the two numbers so that the sum of the first plus the square of the second is a maximum.
- A rancher plans to fence in three sides of a rectangular pasture – with the fourth side being against a rock cliff. He needs to enclose 320,000 square meters of pasture. What dimensions would require the least amount of fence material.



- A box is to be made by cutting small squares from each corner of a 3 ft by 5 ft rectangular piece of material. Find the size of the square cutouts that would produce a box with maximum volume. (Your $V' = 0$ equation will not be factorable. You may use a calculator to solve it.) Show three or more decimal place accuracy.



- Find the volume of the box in Problem 5. Show 3 or more decimal place accuracy.