MAC 1140 Section 3.1

Additional Homework (Max/Min problems)

1) A baseball in thrown straight up from ground level with an initial velocity of 32 ft/sec.
   a) What is the position equation that models this problem?
   b) Find the height of the ball when $t = \frac{1}{4}$ sec. And when $t = \frac{3}{2}$ sec.
   c) Find the maximum height of the ball and the time at which that height is attained.
   d) At what times is the height 7 ft?

2) An object is projected vertically upward from the top of a building with an initial velocity of 144 ft/sec. Its distance *s(t)* in feet above the ground after *t* seconds is given by the equation:

   $$s(t) = -16t^2 + 144t + 100$$

   a) Find its maximum distance above the ground.
   b) Find the height of the building,
   c) How long does it take for the object to hit the ground?

3) What is the largest possible area for a right triangle in which the sum of the lengths of the two shorter sides is 100 in.?

4) Two numbers add up to 6.
   a) Let T denote the sum of the squares of the two numbers. What is the smallest possible value for T?
   b) Let S denote the sum of the first number and the square of the second. What is the smallest possible value for S?
   c) Let U denote the sum of the first number and twice the square of the second number. What is the smallest possible value for U?
   d) Let V denote the sum of the first number and the square of twice the second number. What is the smallest possible value for V?

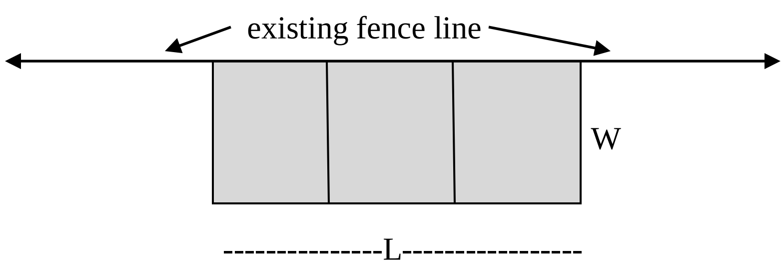
5) Five hundred feet of fencing is available for a rectangular pasture alongside a river, the river serving as one side of the rectangle (so only 3 sides require fencing). What should the dimensions of the rectangle be so that the area of the rectangle is as large as possible? What is the maximum area?

6) Find the smallest possible value of the quantity $x^2 + y^2$ under the restriction that $2x + 3y = 6$.

7) A farmer has 420 ft. of new fencing material with which to enclose 3 areas as shown. The new fenced-in areas adjoin an existing fence line. He does not need to put new fencing material along the existing fence line. If he plans to use ALL 420 ft. of new fencing material to construct the new areas as shown,

a) What is the largest possible area (the shaded on the diagram) that he can enclose?

b) What are the dimensions of the shaded area, *L* and *W*, that will produce the largest possible area?



Answers to this handout:

1) a) $h(t) = -16t^2 + 32t$

b) in ¼ sec: 7 ft., in 3/2 sec: 12 ft

c) max height = 16 ft (this happens in 1 sec.)

d) .25 sec and 1.7 sec

2) a) max height = 424 ft.

b) 100 ft.

c) 9.65 sec.

3) 1250 square inches

4) a) 18 b) 23/4 c) 47/8 d) 95/16

5) 125 ft by 250 ft, max area = 31,250 square ft.

6) 36/13 or 2.77

7) a) 11,025 square ft. b) W = 52.5 ft, L = 210 ft.