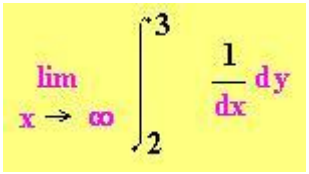


OPTIMIZATION

Prepared by Ingrid Stewart, Ph.D., College of Southern Nevada
Please Send Questions and Comments to ingrid.stewart@csn.edu. Thank you!

Problem 1:

A projectile is fired directly upward with its height (in feet) above the ground after t seconds given by $s(t) = 192t - 16t^2$. Find the following:

a. the velocity after t seconds

b. the acceleration after t seconds

c. the maximum height (use the Second Derivative Test to prove it!)

Problem 2:

Given is a demand (price) function $p(x) = 80 - 0.2x$ in dollars and a cost function $C(x) = 5x + 10$, where x is the number of items produced. Find

a. the revenue function

b. the profit function

c. the maximum profit (use the Second Derivative Test to prove it!)

Problem 3:

A manufacturer determines that x units of a product will be sold if the selling price is $p(x) = 400 - 0.05x$ for each unit. If the production cost for x units is $C(X) = 500 + 10x$, find

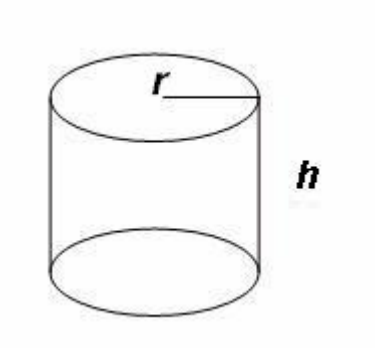
a. the revenue function

b. the profit function

c. the maximum profit (use the Second Derivative Test to prove it!)

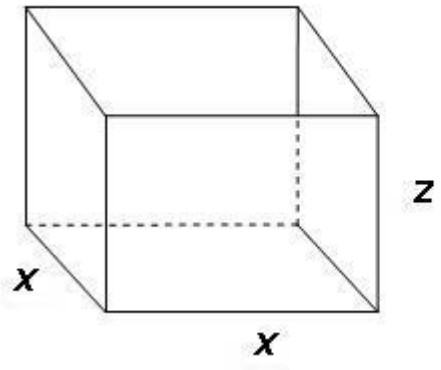
Problem 4:

A metal cylindrical container with an open top is to hold 1 cubic foot. If there is no waste in construction, find the dimensions that require the least amount of material. Round your answers to two decimal places.



Problem 5:

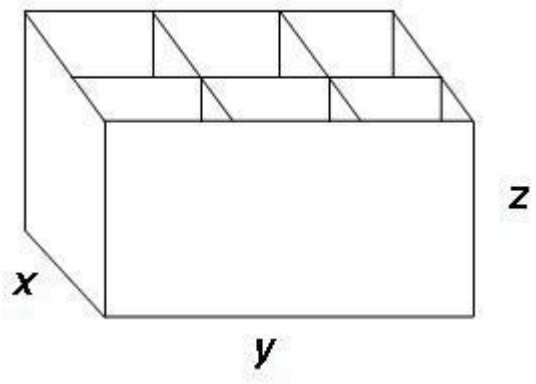
If a box with a square base and open top is to have a volume of 4 cubic feet, find the dimensions that require the least amount of material.



NOTE:
The box has a square base!

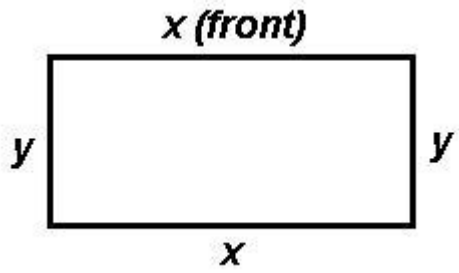
Problem 6:

1,000 feet of chain link fence will be used to construct 6 rectangular animal cages side-by-side arranged in two rows and three columns. Find the dimensions that maximize the enclosed area.



Problem 7:

A builder wishes to fence in 50,000 square meters of land on his property in a rectangular shape. Because of security reasons, the fence along the front part of the land will cost $3 per meter, while the fence for the other three sides will cost $2 per meter. How much of each type of fence will the builder have to buy in order to minimize the cost of the fence? What is the minimum cost?



Problem 8:

An orchard has an average yield of 25 bushels per tree when there are at most 40 trees per acre. When there are more than 40 trees per acre, the average yield decreases by 1/2 bushel per tree for every tree over 40. Find the number of trees per acre that will give the greatest yield per acre.

SOLUTIONS

You can find detailed solutions below the link for this problem set!

1. a. $v(t) = s'(t) = 192 - 32t$ b. $a(t) = v'(t) = -32$ c. ***576 ft***	2. a. $R(x) = xp(x) = 80x - 0.2x^2$ b. $P(x) = R(x) - C(x) = -0.2x^2 + 75x - 10$ c. ***$7,021.25***
3. a. $R(x) = xp(x) = 400x - 0.05x^2$ b. $P(x) = R(x) - C(x) = -0.05x^2 + 390x - 500$ c. ***$760,000***	4. Approx Height 0.68 ft Approx Radius 0.68 ft
5. Width 2 ft Length 2 ft Height 1 ft	6. Width 125 ft Length $166\frac{2}{3}$ ft
7. The builder will have to buy 200 m of fence costing $3 per meter and 700 m of fence costing $2 per meter. Cost of the fence is $2,000.	8. 45 trees per acre