mcv 4U

UNIT # 3 Section 6

REVIEW

Name _____

Date _____

OPTIMIZATION PROBLEMS.

1. Cars cost a dealer $9000 each. If she sells them for $15000 each, she can sell 20 cars/month. For each $500 reduction in the selling price of each car, she can sell two more cars each month. What price should she charge per car for a maximum profit?

2. A cylindrical boiler with an open top is to be built from stainless steel with a copper bottom. The cost of copper is 5 times the cost of stainless steel. Determine the most economical dimensions for the boiler if the volume is 5π m^3.

3. Find the minimum distance from the point $P(3,1)$ to a point $Q(x,y)$ on the curve defined by $y = x^2 + 1$.

4. A metal worker has an 18 m^2 sheet of tin which he has been asked to shape into a rectangular prism without a lid. The prism is 1½ times as long as it is wide. Find the dimensions that will maximize the volume.

5. A lifeguard stationed on a beach with a straight shoreline sees a swimmer in trouble 150 m down the beach and 60 m out in the water. The lifeguard can run 8 m/s on the beach and swim 2 m/s in the water. What path down the shoreline and out into the water should the lifeguard take to reach the swimmer in the shortest amount of time?

Check:

1) $14,500

2) r = 1 m
   h = 5 m.

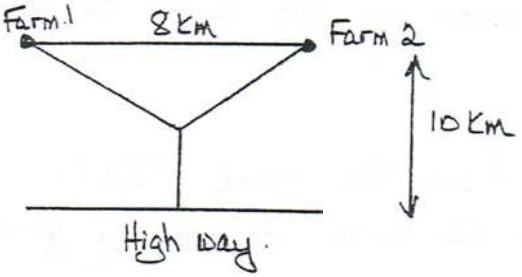
3) $\sqrt{15}$ units

4) w = 2 m
   L = 3 m
   h = 1.2 m

5) land = 134.5 m
   sea = 62.0 m

6. A supermarket is designed to have a rectangular floor area of 3750 m^2, with three walls made of cement blocks and one wall made of glass. In order to conform to the building code, the length of the glass wall must not exceed 60 m but must not be less than 30 m. The cost per linear metre of constructing a glass wall is twice that of constructing a cement wall. Find the dimensions of the floor area that will minimize the cost of building the walls.

7. Two isolated farms are situated 8 km apart on a straight country road. The main highway runs parallel to their road but it is 10 km away. The telephone company decides to run the wires from the highway in a Y shape as shown. What is the shortest total route that can be used?



8. Find the area of the largest rectangle (with sides parallel to the coordinate axes) that can be enclosed by the graphs of $f(x) = 18 - x^2$ and $g(x) = 2x^2 - 9$.

9. The operating cost of a truck is $\left(12 + \frac{v}{8}\right)$ cents per kilometre when it runs at v km/h. The driver earns $10 per hour. Find the most economical speed for a 500 km trip if trucks are required to travel between 50 km/h and 100 km/h.

6) 50m
length = 75m
16.93 km
$36\sqrt{3}$ un^2
9) 89.4 km/h