L6 – Optimization Problems Unit 2

MCV4U

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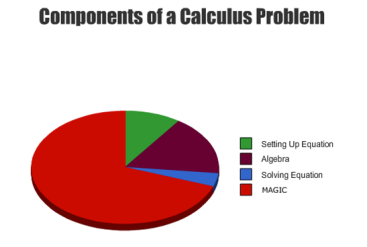
Tips for Optimization Problems:

- Diagrams can be helpful
- Identify the independent variable and express all other variables in terms of it
- Define a function in terms of the independent variable
- Identify any restriction on the variable
- Solve for $f'(x) = 0$ to identify critical points
- Check critical points and endpoints



Optimization Warm Up:

A lifeguard has 200 meters of rope and some buoys with which she intends to enclose a rectangular area at a lake for swimming. The beach will form one side of the rectangle, with the rope forming the other 3 sides. Find the dimensions that will produce the maximum enclosed area.

Example 1: A cardboard box with a square base is to have a volume of 8 Liters (1 L = 1000 cm^3)
Find the dimensions that will minimize the amount of cardboard to be used. What is the minimum surface area?

Example 2: A soup can of volume 500 cm^3 is to be constructed. The material for the top costs $0.4¢/cm^2$ while the material for the bottom and sides costs $0.2¢/cm^2$. Find the dimensions that will minimize the cost of producing the can. What is the min cost?

Example 3: Ian and Ada are both training for a marathon. Ian's house is located 20 km north of Ada's house. At 9:00 am one Saturday, Ian leaves his house and jogs south at 8 km/h. At the same time, Ada leaves her house and jogs east at 6 km/h. When are Ian and Ada closest together, given that they both run for 2.5 hours?