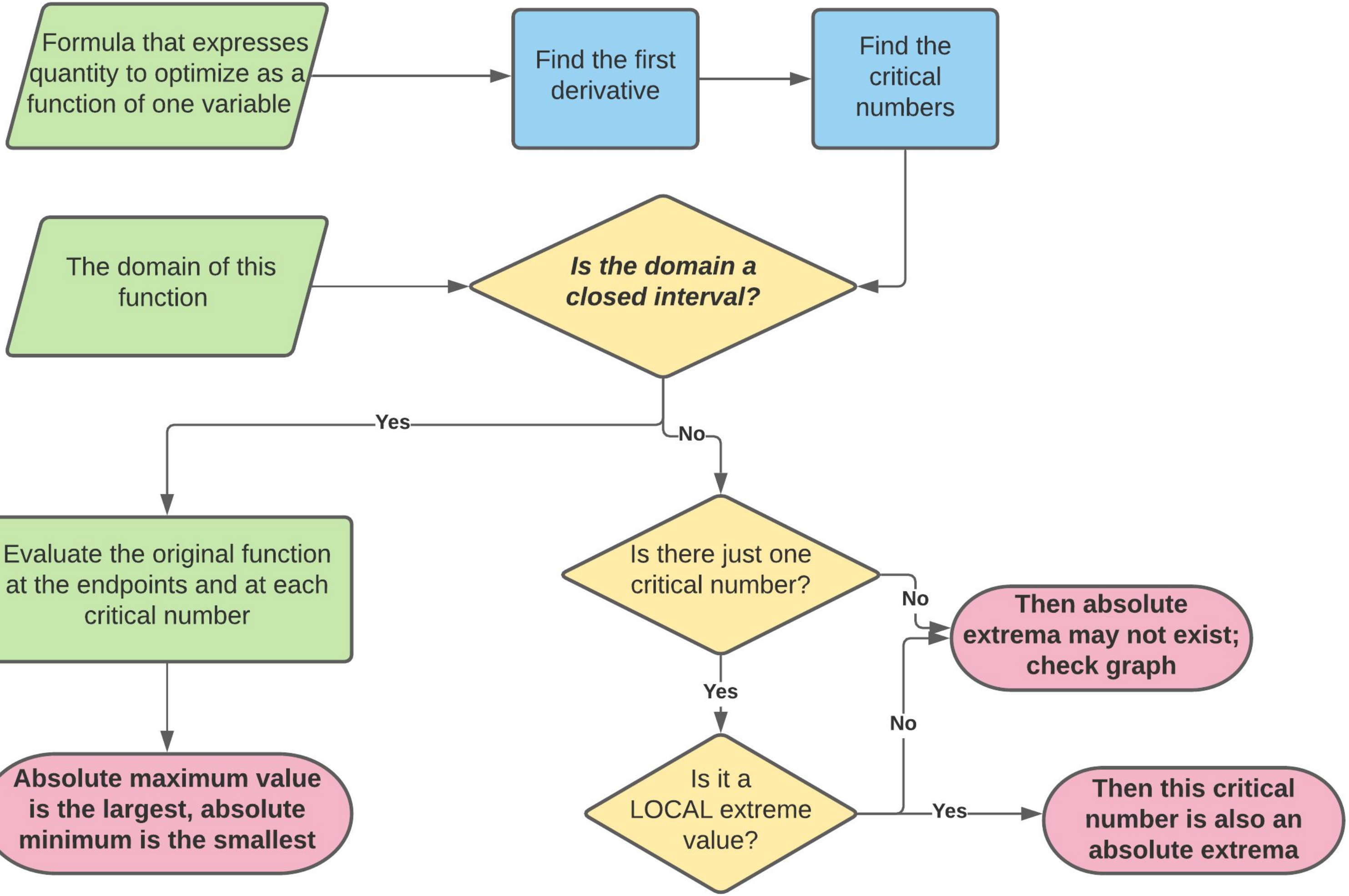
MTH 201 -- Calculus
Module 9A: Introduction to applied optimization

November 4-5, 2020

Into breakout groups to discuss/debrief Daily Prep problem -- then report back

Use Calculus techniques from earlier modules to find the exact value of the input that gives the maximum volume, and the exact value of that volume


Formula that expresses quantity to optimize as a function of one variable
Find the first derivative
Find the critical numbers
The domain of this function
Is the domain a closed interval?
Yes
No
Evaluate the original function at the endpoints and at each critical number
Absolute maximum value is the largest, absolute minimum is the smallest
Is there just one critical number?
No
Then absolute extrema may not exist; check graph
Yes
Is it a LOCAL extreme value?
No
Yes
Then this critical number is also an absolute extrema

Optimizing the cost of a soup can

Activity 3.4.2. A soup can in the shape of a right circular cylinder is to be made from two materials. The material for the side of the can costs \$0.015 per square inch and the material for the lids costs \$0.027 per square inch. Suppose that we desire to construct a can that has a volume of 16 cubic inches. What dimensions minimize the cost of the can?

a. Draw a picture of the can and label its dimensions with appropriate variables.

Before going to the next steps: Think about two different cans --- one whose circular end has a radius of 1 inch and another whose circular end has a radius of 2 inches.

- What are the heights of each of those cans? (Do you get a choice, or is this value forced on you by a constraint in the problem?)
- What is the surface area of each of those cans?
- What is the cost of each of those cans?

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a. Draw a picture of the can and label its dimensions with appropriate variables.

b. Use your variables to determine expressions for the volume, surface area, and cost of the can.

c. Determine the total cost function as a function of a single variable. What is the domain on which you should consider this function?

d. Find the absolute minimum cost and the dimensions that produce this value.

More to come

ASK QUESTIONS