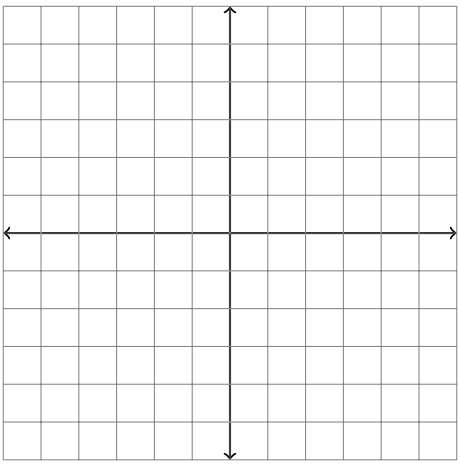
1. A farmer wants to fence off an area for their cows to graze. They want to enclose a rectangular area for the animals. Cows don't like to swim, so the side along the river does not need fencing. The farmer has materials to make 240 feet of fencing. Follow these steps to determine the largest area that could be fenced off:

1. Draw a sketch of the grazing area and fence, labeling the lengths.
2. Write an equation for the area inside the fence in terms of the lengths.
3. Write a relationship between the lengths (hint: the farmer will use all of the fencing) and use it to simplify the previous equation to a function of one variable.
4. (optional) Sketch the area function.
5. Find the domain of the area function.
6. Find the maximum possible area for the pen.



2. A chemist is working with a chemical reaction that can produce a significant amount of heat. The total amount of heat released by her reaction is a function of the amount of input:

$$H(x) = -\frac{1}{3}x^3 + 6x^2 - 32x + 80 \quad \text{kilojoules}$$

(for x between 3 and 10). For safety reasons, she wants to be sure that the heat produced never exceeds 50 kilojoules. Is this the case? (hint: find the maximum of $H(x)$ on the domain and compare to 50)

3. Sunlight causes damage to most plastics. You store a 15 foot **canoe in a partly shaded area and want to know where to inspect most closely for damage. The amount of sun exposure as a function of distance from the front of the canoe is**

$$S(x) = 2x^3 - 51x^2 + 360x + 2500$$

Where is damage most likely to occur first?

4. Suppose that you have some function determined by a rate equation:

$$f'(x) = 20(x - 10)(x - 30)$$

$$f(0) = 100$$

Using this information, identify the critical points of $f(x)$ and whether they are local maxima or minima.