Worksheet #5
(Due Wednesday, September 11)

**Problem 1.** Find the absolute maximum and minimum of the following functions in their respective intervals:

a) $f(x) = x^5 - x$ in $[-1, 0]$

b) $f(x) = \frac{x-1}{x^2+1}$ in $[-1, 1]$

c) $f(x) = \frac{\sqrt{x-1}}{x^2+x+1}$ in $[\frac{3}{2}, \frac{7}{2}]$

Problem 2. A power station is on one side of a river that is 0.5 kilometers wide, and a factory is 6 kilometers downstream on the other side of the river (see figure). It costs \$18 per kilometer to run overland power lines and \$25 per kilometer to run underwater power lines.
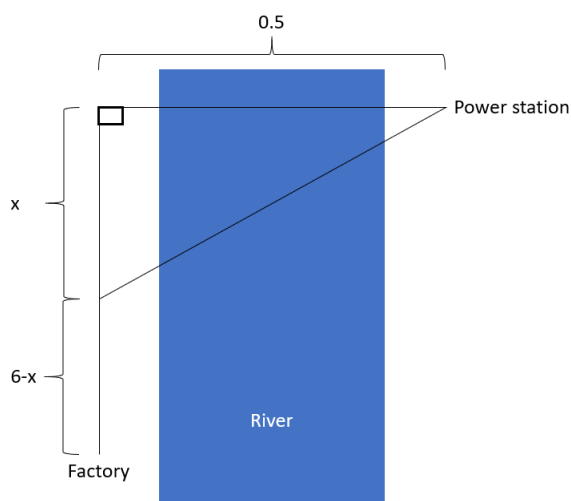
a) Write the cost function $C(x)$ of the cost of installing the power lines from the power station to the factory, where x is given by the diagram.

b) Find the value of x that minimizes that cost function.

Problem 3. A farmer has 500 meters of wire, which they want to use to make two rectangular plots of equal size, with a separation in the middle parallel to one of the sides of the rectangle. What is the maximum area that can be enclosed using this amount of wire?

Problem 4. (Practice for the exam) Sketch the graph of the following functions in its maximum domain. Show all of your steps (you can then compare with a graphing software such as Desmos).

a)

$$f(x) = \frac{\sqrt[3]{x}}{x^2 + 2x - 3}$$

b)

$$f(x) = \frac{x^2 + 1}{x^3 - 1}$$