utions

Math 1A Spring 2025 Optimization Worksheet

April 11, 2025

1. A farmer has 2000 feet of fencing and wants to fence off a field bordering a straight river. He needs no fence along the river. What dimensions of the field give the largest



2. A man launches his boat from point A on the bank of a straight river, 4 km wide, and wants to reach point B on the opposite bank (10 km downriver) in the shortest time. Let us assume that the river is still. The man can row at 5 km/h and run at 8 km/h. He may row directly across the river to a point C, or to some point x km downstream between C and B. What should x be to reach point B as quickly as possible? $t^{l} = 0$ at $5x - 5\sqrt{16}x^{2} = 0$ $t^{l'} < 0$

3. A rectangular storage container with an open top must have volumen of 10 cubic meters. The length of its base must be twice the width of the base. Material for the base costs \$ 10 per square meter, and for the side costs \$ 6 per square meter. Find the cost of the cheapest container with these requirements.

$$\frac{(6)(x+449)}{(2x^{2}(19)+6xh(6)=(3) \in \mathbb{C})} \qquad \begin{array}{c} \mathcal{L} = 29x^{2} + 36\left(\frac{5}{x}\right) \\ \mathcal{L}^{1} = 49x - \frac{180}{x^{2}} \\ \mathcal{L}^{1} =$$

4. Show that of all rectangles with a given area, the one with the smallest perimeter is a square. Show that for all rectangles of a given perimeter, the one with the largest area is a square. $\chi_{\mathcal{Y}} : \mathcal{A}$ $\mathcal{P} := 2\chi_{\mathcal{T}} : \mathcal{A}$



$$P = 2x + 2y$$

$$= 2x + 2(A/x)$$

$$P' = 2 + \frac{2A}{x^2}$$

$$= 0 \quad a_F \quad x = \sqrt{AT}$$

5 Find the area of the largest rectangle that can be inscribed in a circle of radius 1.

6. Find the area of the largest rectangle that can be inscribed in the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

