Allen – Math 160 A Quiz #08 Name: Key

1. Determine the absolute extrema of $f(x) = 2x^2 + 3x - 1$ on $[-1, 2]$.

$f'(x) = 4x + 3$; $f'(x) = 0 \Rightarrow 4x + 3 = 0 \Rightarrow 4x = -3 \Rightarrow x = -3/4$.

$f(-1) = 2(-1)^2 + 3(-1) - 1 = 2 - 3 - 1 = -2$

$f(-3/4) = 2(-3/4)^2 + 3(-3/4) - 1 = 9/8 - 9/4 - 1 = -9/8 - 1 = -17/8 = -2.125$

$f(2) = 2(2)^2 + 3(2) - 1 = 8 + 6 - 1 = 13$

8

Absolute max: $(2, 13)$

Absolute min: $(-3/4, -17/8)$

2. Melissa decided to put two adjacent lots along a canal in such a way that the side labeled x in the figure requires no fencing. Assuming that she has 400 feet of fencing, determine the dimensions x and y of the rectangle that maximize the total area. What is the maximum area?

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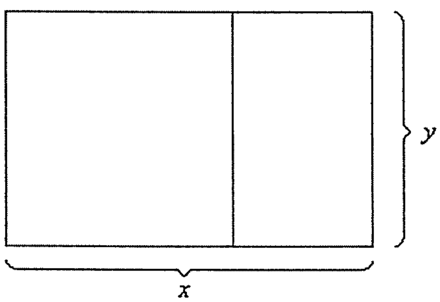

$A = xy$

$x + 3y = 400$

$\Rightarrow 3y = 400 - x$

$\Rightarrow \boxed{y = \frac{1}{3}(400 - x)}$ 3

$\Rightarrow A(x) = x \cdot \frac{1}{3}(400 - x)$

$\Rightarrow \boxed{A(x) = -\frac{1}{3}x^2 + \frac{400}{3}x}$ 4

$A'(x) = -\frac{2}{3}x + \frac{400}{3}$, $A'(x) = 0 \Rightarrow -\frac{2}{3}x + \frac{400}{3} = 0 \Rightarrow \frac{2}{3}x = \frac{400}{3}$

$\Rightarrow x = \frac{400}{3} \cdot \frac{3}{2} \Rightarrow \boxed{x = 200 \text{ ft}}$ 2

$y = \frac{1}{3}(400 - x) = \frac{1}{3}(400 - 200) = \frac{200}{3} \Rightarrow \boxed{y = \frac{200}{3} = 66.667 \text{ ft}}$ 2

Maximum area $= 200 \cdot \frac{200}{3} = \frac{40{,}000}{3} \text{ ft}^2 = \boxed{13{,}333.33 \text{ ft}^2}$ 1