KEY

ICM Unit 1 Quiz 1 Review Part 2

1. The dimensions in inches of a shipping box at **We Ship 4 You** have width x, length 5 inches more than the width, and height 1 inch less than 3 times the width. The volume is about 7.6 **ft.**^{3}. Find the dimensions of the box in inches. **Round to the nearest inch.** Regular Polynomial Problem

W: X
L: X + 5
H: 3X − 1

$X(X+5)(3X-1) = 13132.8$

$X(X+5)(3X-1) - 13132.8 = 0$

$\frac{7.6\ ft^3}{1} \times \frac{12\ in}{1\ ft} \times \frac{12\ in}{1\ ft} \times \frac{12\ in}{1\ ft} = 13132.8\ in^3$

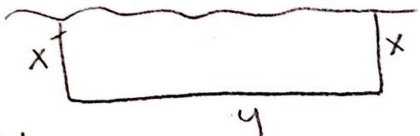
X-intercept: X = 14.972 in.

$\boxed{14.972\ in \times 19.972\ in \times 43.916\ in}$

2. A farmer has 2400 ft of fencing and wants to fence off a rectangular field that borders a straight river. He needs no fence along the river. What are the dimensions of the field that has the **largest** area?

MAX

Optimization



④ Find y: Y = 2400 − 2(600)

$\boxed{Y = 1200\ ft}$

2400 = 2X + Y
A = XY

① Y = 2400 − 2X

② A = X(2400 − 2X) → Graph

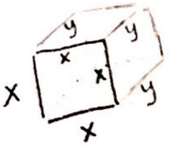
③ Max: (600, 72,000) $\boxed{X = 600\ ft}$
X A

3. We want to construct a box with a square base, and we only have 10 m^2 of material to use in the construction of the box. Assuming that all of the material is used, determine the maximum volume that the box can have.

Surface area

optimization

$V = X^2 Y$



$10 = 2X^2 + 4XY$

$\frac{10 - 2X^2}{4X} = \frac{4XY}{4X}$

$\frac{10 - 2X^2}{4X} = Y$

$V = X^2\left(\frac{10 - 2X^2}{4X}\right)$

Graph

Max: (1.732, 5.196)
X V

$\boxed{\text{Max volume} : 5.196\ m^3}$

4. We're going to form an **open** box from a 14in. X 10in. piece of cardboard by cutting squares out of each corner and folding the sides up. Determine the height of the box that will yield the **maximum** volume.

open box problem → X is height of box

$V = (14 - 2X)(10 - 2X)X$

Graph

Max: (1.918, 120.164)
X V

The height of the box that gives the max volume is 1.918 in.