Linear Programming

1. Assign variables
2. Write Objective Function
3. Write Inequalities
4. Isolate y ; Graph (desmos.com)
5. Identify corner points
6. Test corner points in objective function to find max or min
7. Express answer as a sentence

A refinery produces oil and gas.

- At least 2 L of gasoline is produced for each litre of heating oil.
- The refinery can produce up to 9 million litres of heating oil and 6 million litres of gasoline each day.
- Gasoline is projected to sell for \$1.10 per litre. Heating oil is projected to sell for \$1.75 per litre.

The company needs to determine the daily combination of gas and heating oil that must be produced to maximize revenue. Create a model to represent this situation.

① Assign variables

x = litres of gas

y = litres of oil

② Objective Function

$R = 1.10x + 1.75y$

$V = 0 + 0 = 0$ (min)

$V = 0 + 4 = 4$

$V = 6 + 4 = 10$

$V = 12 + 0 = 12$ (max)

③ Write Inequalities

$y \leq 9\,000\,000$

$x \leq 6\,000\,000$

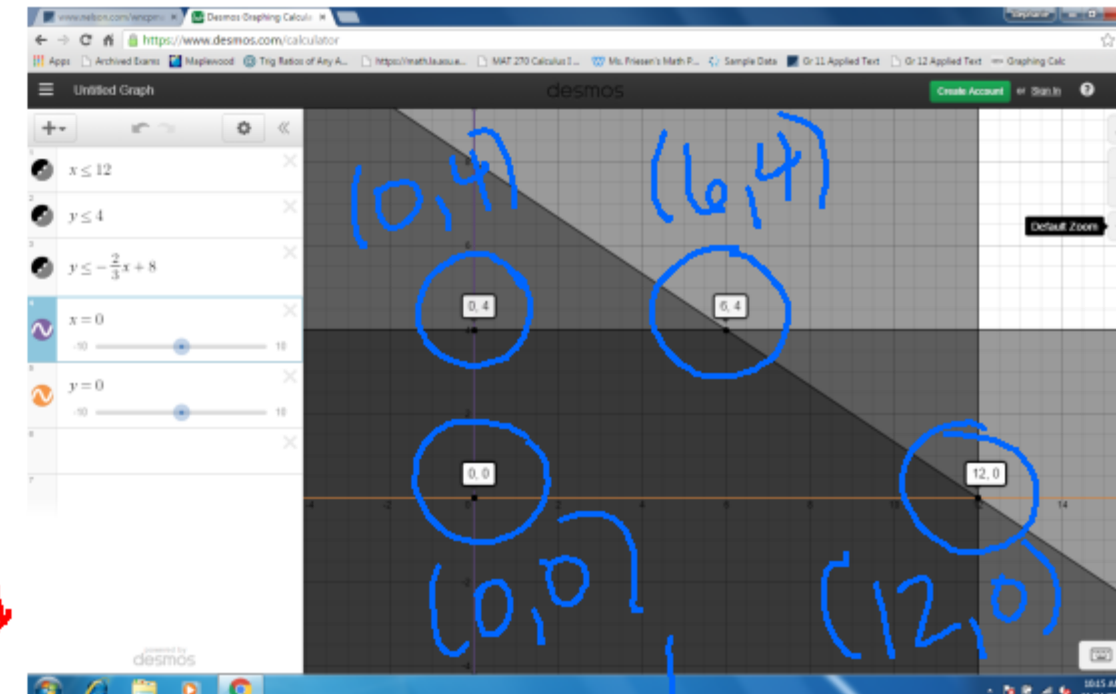
$x \geq 2y$

$x \geq 0$

$y \geq 0$

use as x and y min in window

$y \leq -\frac{2}{3}x + 8$



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① Assign variables

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② Objective Function

$R = 1.10x + 1.75y$

③ Write Inequalities

$$\boxed{\begin{aligned} y &\le 9\,000\,000 \\ x &\le 6\,000\,000 \end{aligned}}$$

$x \ge 2y$

$x \ge 0$ (x=0)

$y \ge 0$ (y=0)

④ Isolate y:

$$\frac{x}{2} \ge \frac{2y}{2}$$

$$\boxed{y \le \frac{x}{2}}$$

⑤ Graph

See end of notes for graph

⑥ Use objective function

$R = 1.10(0) + 1.75(0)$
$= 0$

max
$$\boxed{\begin{aligned} R &= 1.10(6\,000\,000) + 1.75(3\,000\,000) \\ &= \$11\,850\,000 \end{aligned}}$$

$R = 1.10(6\,000\,000) + 1.75(0)$
$= 6\,600\,000$

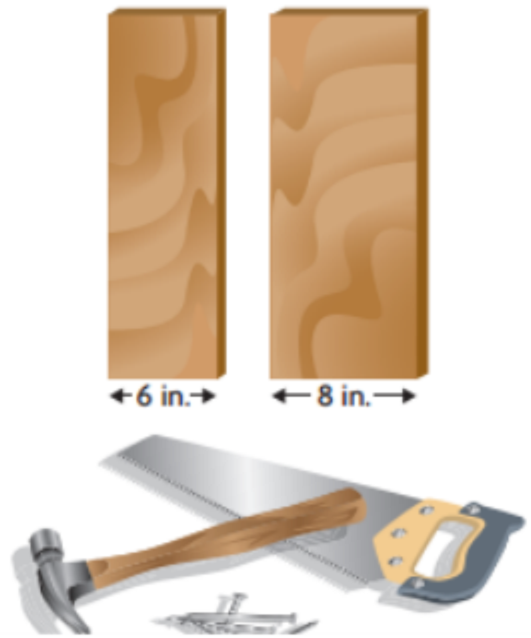
p. 338

EXAMPLE 2 Creating a model for an optimization problem, and solving the problem

L&G Construction is competing for a contract to build a fence.

- The fence will be no longer than 50 yd and will consist of narrow boards that are 6 in. wide and wide boards that are 8 in. wide.
- There must be no fewer than 100 wide boards and no more than 80 narrow boards.
- The narrow boards cost \$3.56 each, and the wide boards cost \$4.36 each.

Determine the maximum and minimum costs for the lumber to build the fence.



① Assign variables

x = narrow boards

y = wide boards

② Objective Function

$C = 3.56x + 4.36y$

③ Inequalities

1 yd = 36 in

$50(36) = 1800$ in.

$6x + 8y \le 1800$

Isolate y

$8y \le -6x + 1800$

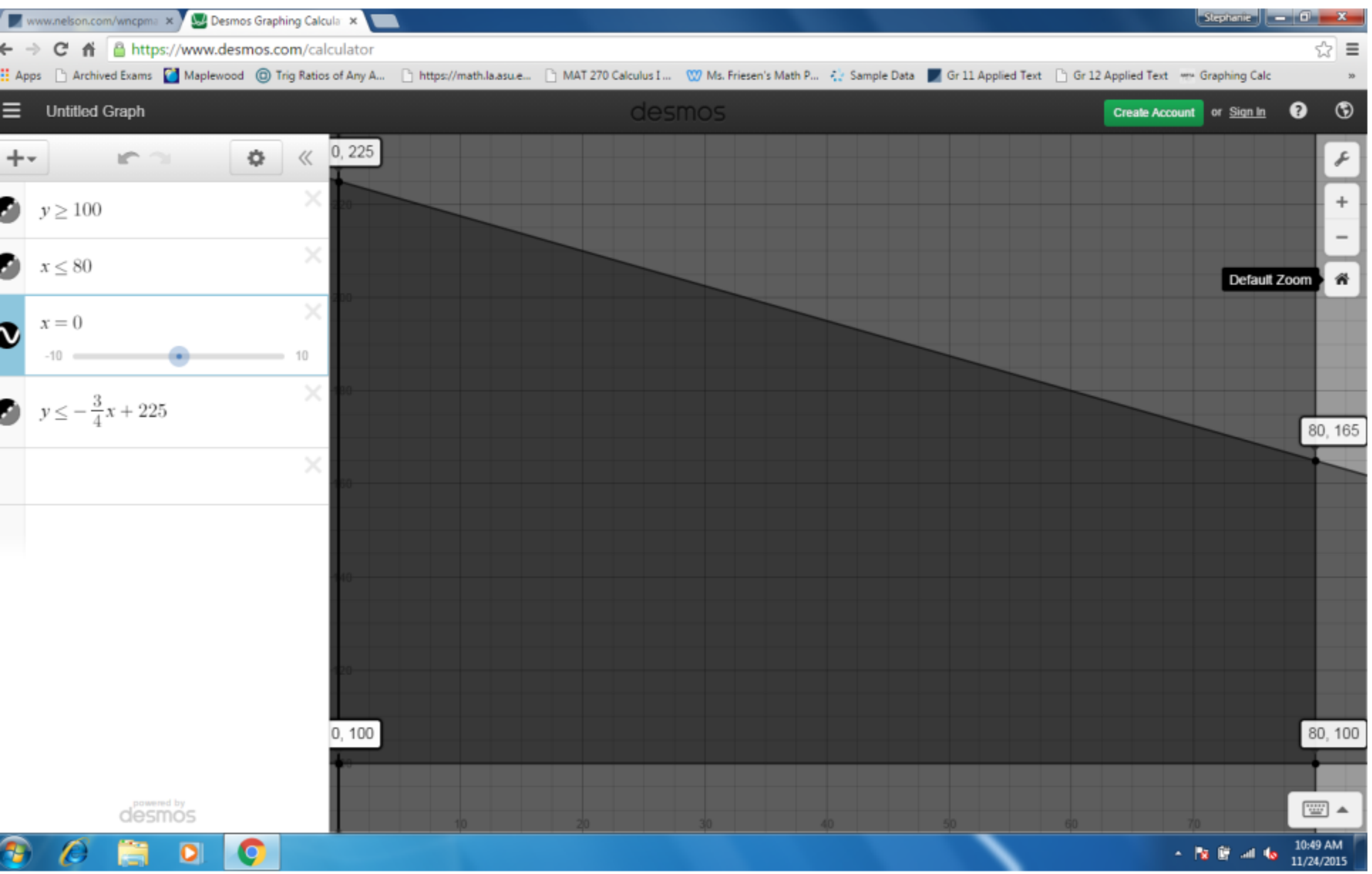
$y \le -\frac{6x}{8} + \frac{1800}{8}$

$y \le -\frac{3}{4}x + 225$

$y \ge 100$

$x \le 80$

$x \ge 0$ $(x = 0)$



0 narrow boards and 100 wide would minimize cost. 80 narrow boards and 165 wide boards would maximize cost.

$C = 3.56x + 4.36y$

(0,100)

$C = 3.56(0) + 4.36(100)$

$= \$436$

min

(0,225)

$C = 3.56(0) + 4.36(225)$

$= \$981$

(80,165)

$C = 3.56(80) + 4.36(165)$

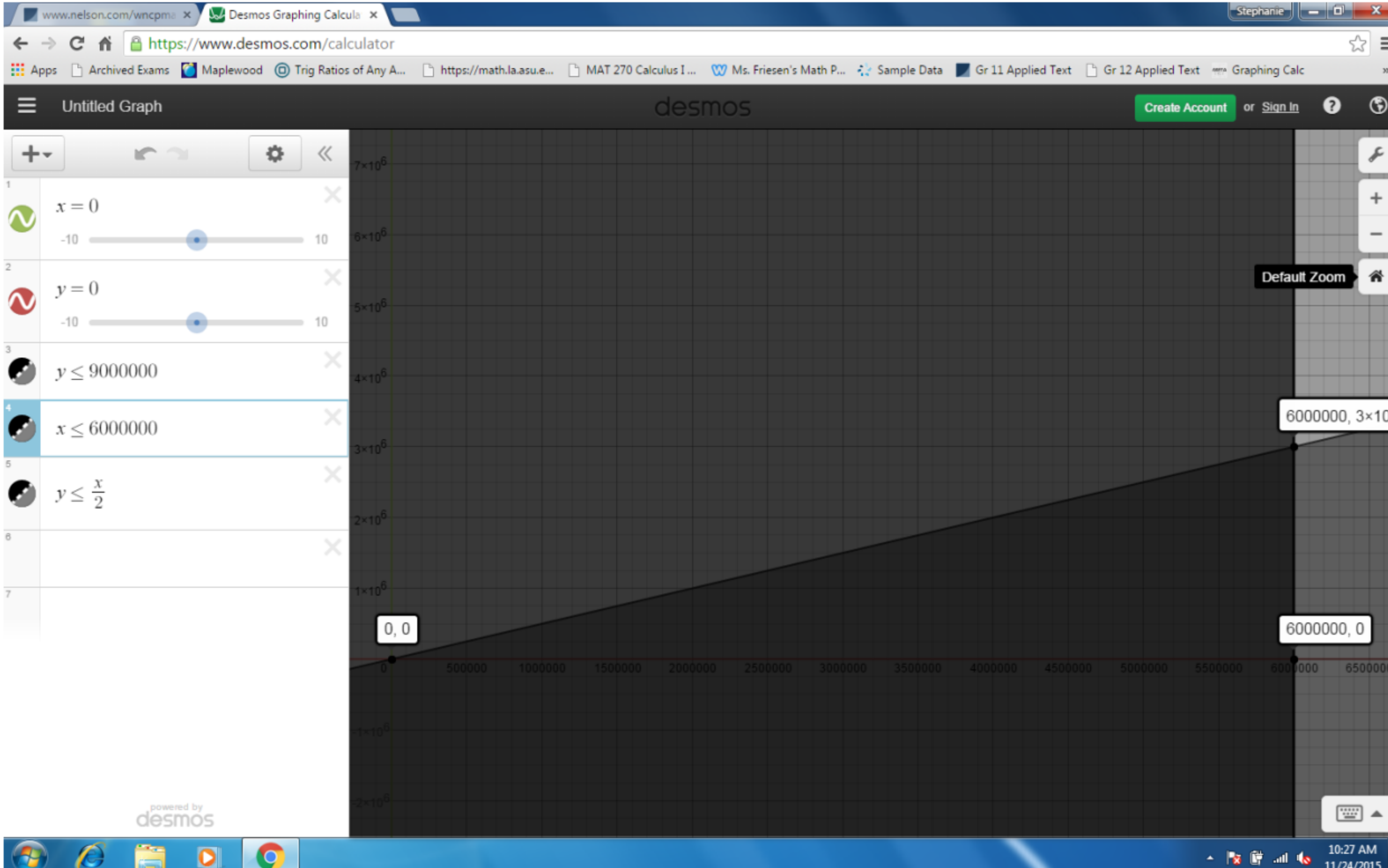
$= \$1004.20$

max

(80,100)

$C = 3.56(80) + 4.36(100)$

$= \$720.90$


www.nelson.com/wncpma
Desmos Graphing Calcula
Stephanie
https://www.desmos.com/calculator
Apps
Archived Exams
Maplewood
Trig Ratios of Any A...
https://math.la.asu.e...
MAT 270 Calculus I ...
Ms. Friesen's Math P...
Sample Data
Gr 11 Applied Text
Gr 12 Applied Text
Graphing Calc
Untitled Graph
desmos
Create Account
or
Sign In
$x = 0$
-10
10
$y = 0$
-10
10
$y \leq 9000000$
$x \leq 6000000$
$y \leq \frac{x}{2}$
powered by
desmos
Default Zoom
7×10^6
6×10^6
5×10^6
4×10^6
3×10^6
2×10^6
1×10^6
-1×10^6
-2×10^6
6000000, 3×10^6
0, 0
6000000, 0
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500000
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