

MA 162: Finite Mathematics - Chapter 1
Fall 2014

Ray Kremer

University of Kentucky

Linear Equations

Linear equations are usually represented in one of three ways:

1 Slope-intercept form: $y = mx + b$

2 Point-Slope form: $y - y_0 = m(x - x_0)$ or $y = m(x - x_0) + y_0$

3 General form: $Ax + By + C = 0$

Equation of a Line 1

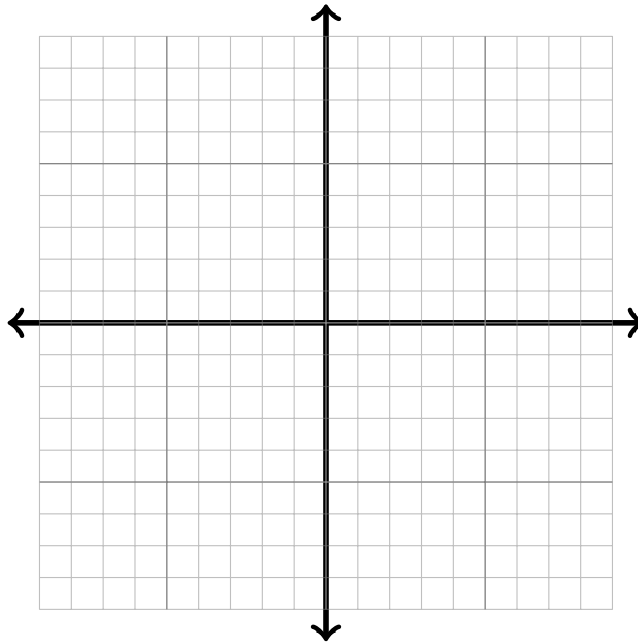
A line passes through the points $(4, 3)$ and $(6, 7)$.

(a) Determine the slope of this line.

(b) Find an equation of this line.

(c) Sketch the graph of this line.

Equation of a Line 2



General Form of a Line 1

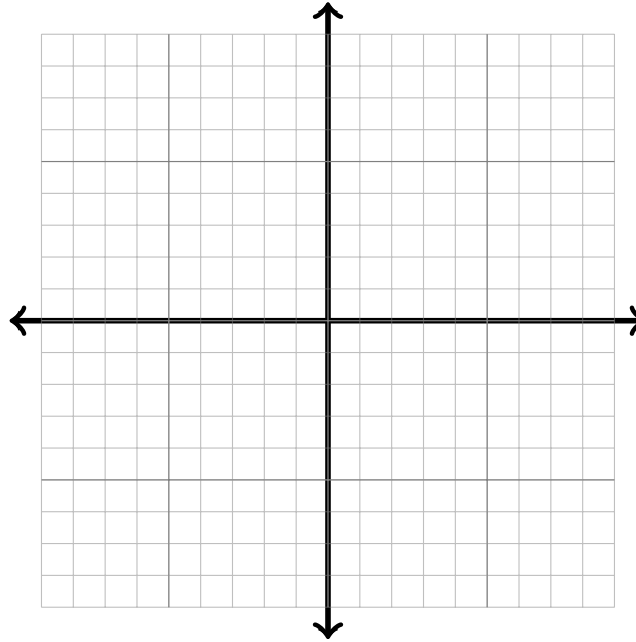
Consider the line with equation $4x + 2y = 12$.

(a) Find the x -intercept of the line.

(b) Find the y -intercept of the line.

(c) Sketch the graph of the line.

General Form of a Line 2



(d) If x increase, does y increase or decrease?

General Form of a Line 3

We are still considering $4x + 2y = 12$.

(e) If x increases by 2, what happens to y ?

(f) If x decreases by 3, what happens to y ?

General Form of a Line 4 - Special Cases

(a) What can we say about $Ax + By + C = 0$ if $A = 0$?

(b) What can we say about $Ax + By + C = 0$ if $B = 0$?

General Form of a Line 5 - Special Cases

(c) What can we say about $Ax + By + C = 0$ if $C = 0$?

1.3 - Linear Depreciation I

- (1) A truck is originally purchased for \$28,000. The value of the truck depreciates linearly until it is worth \$1,000 nine years after it was purchased.
 - (a) At what rate is the truck value depreciating?
 - (b) What is the value of the truck after 3 years?
 - (c) Write an equation that represents the value of the truck after t years.

1.3 - Linear Cost, Revenue, and Profit I

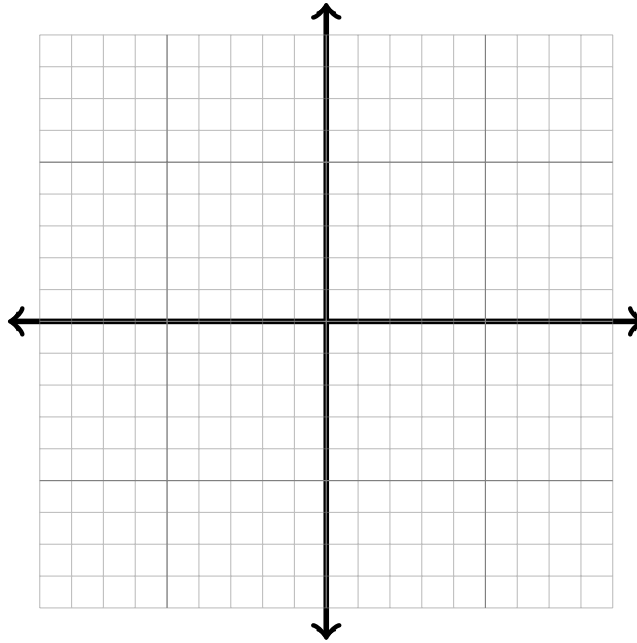
- (2) A company runs an assembly line to put together new computers. The total cost of the parts will depend on the number of computers produced (*variable costs*), but some costs, like renting the building, do not depend on the number of computers produced (*fixed costs*). The overall cost of producing computers incorporates both types of cost. Let x be the number of computers sold by the company.
- (a) Suppose the company's fixed costs are \$10,000 and the variable costs are \$300. Write an equation for the overall cost function, $C(x)$.

1.3 - Linear Cost, Revenue, and Profit II

- (b) If the company sells each computer for \$750, then write an equation for the revenue function, $R(x)$.
- (c) Using the previous two answers, what is the overall profit the company makes? Write your answer as a function of x .

1.3 - Linear Cost, Revenue, and Profit III

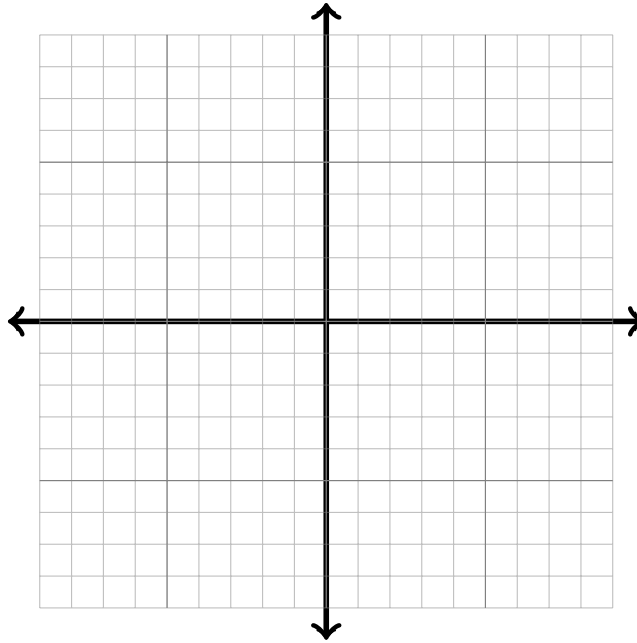
- (d) Graph the cost function, $C(x)$ as a function of the number of computers sold, x .



- (e) What does the vertical intercept represent on this graph?

1.3 - Linear Cost, Revenue, and Profit IV

- (f) Graph the profit function, $P(x)$ as a function of the number of computers sold, x .



- (g) What does the horizontal intercept represent on this graph?

1.3 - Linear Supply and Demand Curves

The third type of application problem we will discuss in this section involves supply and demand curves.

- In general, supply and demand can be many types of equations, but in this course we will only see linear supply and demand equations.
- You are trying to determine how much to charge for the item you are selling.
 - Typically if you increase the price of your item then fewer people want to buy it (demand decreases), but the supplier wants to sell as many as possible (supply increases).
 - Typically if you decrease the price of your item then more people want to buy it (demand increases), but the supplier wants to sell fewer (supply decreases) because you won't make as much money per item.
 - What do you do?

Tan section 1.4, #27, modified part I

- (3) The demand equation for the Schmidt-3000 tablet computer is $3x + p - 1500 = 0$, where x is the quantity demanded per week and p is the unit price in dollars. The company will supply 300 units if the price is \$600 and 600 units if the price is \$800. Find the equilibrium quantity and equilibrium price for the tablet computers.
- (a) Write the demand equation as a function of x . That is, solve the given equation for p .
- (b) What is the slope of the demand equation? What does this mean in the context of the problem?

Tan section 1.4, #27, modified part II

- (c) In plain english, what does the vertical intercept mean for the demand equation?
- (d) In plain english, what does the horizontal intercept mean for the demand equation?

Tan section 1.4, #27, modified part IV

- (g) What is the vertical intercept of supply equation? In plain english, what does this mean?

- (h) What is the horizontal intercept of supply equation? In plain english, what does this mean?

Tan section 1.4, #27, modified part V

- (i) What are the equilibrium quantity and the equilibrium price for selling tablet computers in this problem?

Tan section 1.4, #27, modified part VI

