PPPA 6085
Intermediate Microeconomics
Math Review Handout – Solutions

Graphing a Linear Equation

$Q = 500 - 50P$

Plug in the zeros

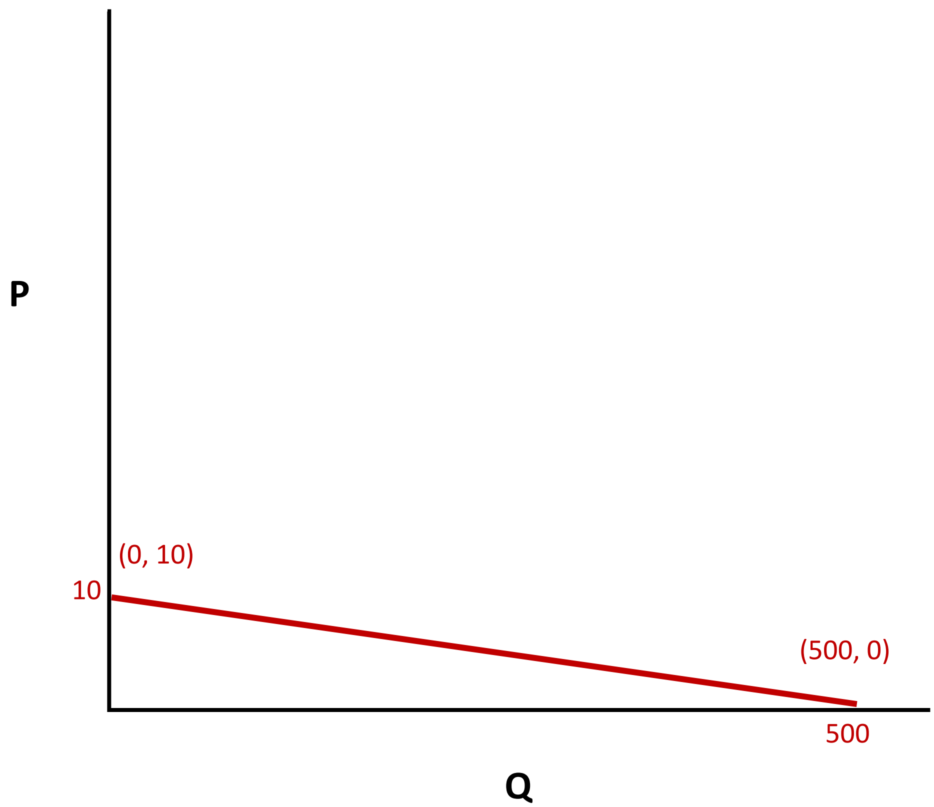
Where does the line intersect with the vertical axis? Where does the line intersect with the horizontal axis?

When Q is 0, P = ____

$0 = 500 - 50P$
$50P = 500$
$P = 500/50 = 10$

When P is 0, Q = ____

$Q = 500 - 50(0)$
$Q = 500$



Find the Slope

Slope is rise over run. Alternatively stated, slope is the change in P over the change in Q.

Using the vertical and horizontal intercepts above, we start at point (0, 10) and move along the line to point (500, 0). The rise is -10 and the run is 500. So the slope is:

-10/500 = -1/50 or -0.02

There is another way to fond the slope that you will need to know.

Q = 500 – 50P

Solve for P:

50P = 500 – Q

P = 10 – 0.02Q

Recall from algebra (or Khan Academy) that the slope-intercept form of a linear equation is y = mx + b, where m is the slope and b is the y-intercept. How does the equation above relate to the slope-intercept form of a linear equation?

y = P

m = -0.02

x = Q

b = 10

Q = 10 + P

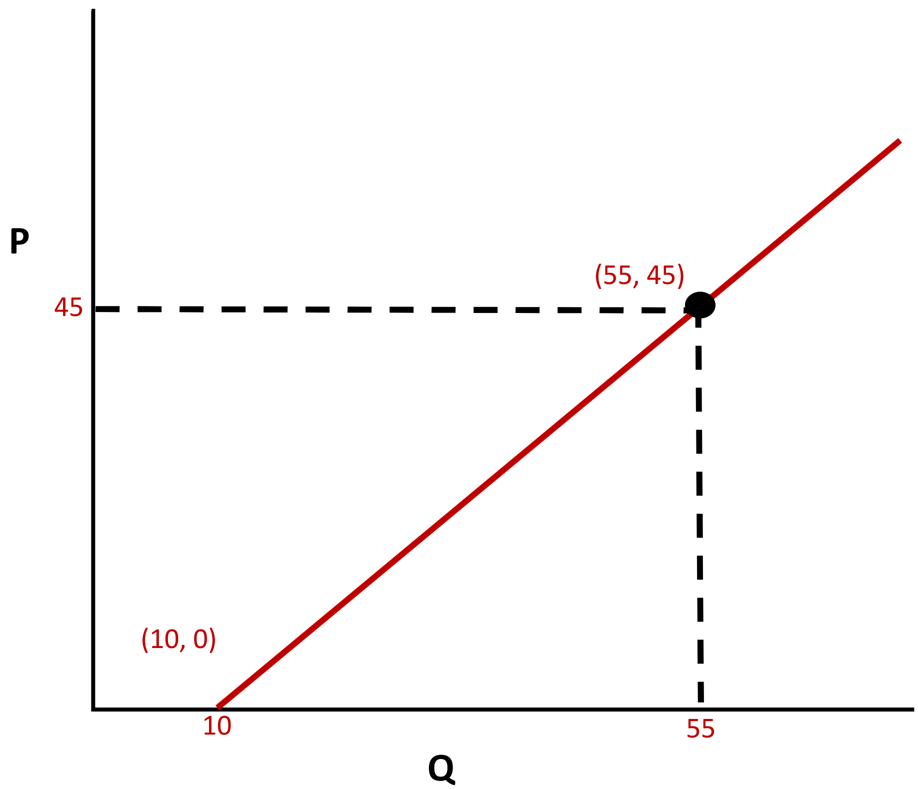
P = -10 + Q

P-intercept: -10 (There's no such thing as a negative price.)

Q-intercept: 10

Slope: 1

There is no such thing as a negative price or negative demand, so in this class we only use quadrant I on the graph. So how would you graph this? You can graph this because you have the slope. The slope is 1, so for every rise of 1 there is also a run of 1. If the rise is 45 then the run is 45. Starting at point (10, 0) draw the line at a 45 degree angle away from the P axis.



Notice that the slope is positive. That means this equation represents supply. Demand equations have a negative slope.

Group Work

Q = 1/2 – 3/4(P)

3/4(P) = 1/2 – Q

P = (1/2 ÷ 3/4) – (Q ÷ 3/4)

P = (1/2 * 4/3) – 4/3(Q)

P = 2/3 – 4/3(Q)

P-intercept: 2/3

Q-intercept: 1/2

Slope: -4/3

2,000Q = 10,000 – 5,000P

5,000P = 10,000 – 2,000Q

P = 2 – 0.4Q

P-intercept: 2

Q-intercept: 5,000

Slope: -0.4

Solving a System of Two Linear Equations

$Q_D = 50 - 10P_D$

$Q_s = 20 + 5P_S$

We want to know where these two lines meet; that is, where does $Q_D = Q_S$ and $P_D = P_S$?

$Q_D = Q_S = 50 - 10P = 20 + 5P$

Solve for P

$50 - 10P = 20 + 5P$

$30 = 15P$

$P = 2$

Plug P into either the demand or the supply equation

$Q_D = 50 - 10(2)$

$Q_D = 50 - 20 = 30$

$25Q_D = 50 - P_D$; $Q_S = 5P_S$

There are two ways to solve it. You can isolate Q_D and then set the equations equal to each other, as described below:

Isolate Q_D:

$Q_D = 2 - 0.04P_D$

Set the equations equal to each other and solve:

$2 - 0.04P = 5P$

$5.04P = 2$

$P = 0.397$ (last digit rounded up)

Or, you can simply plug Q_s into the demand function:

$25(5P) = 50 - P$

$125P = 50 - P$

$126P = 50$

$P = 0.397$ (last digit rounded up)

Now, plug P into one of the original equations:

$Q_s = 5(0.397) = 1.985$

Group Work

$1/4Q_D = 1/2 - P_D$; $Q_s = 1/4 + 1/2P_S$

Plug Q_s into demand equation

$1/4(1/4 + 1/2P) = 1/2 - P$

$1/16 + 1/4P = 1/2 - P$

$5/4P = 7/16$

$P = 7/16 * 4/5 = 7/(4*4) * 4/5 = 7/20 = 0.35$

$8Q_D = 6 - 14P_D$; $3Q_s = 2 + 13P_S$

Isolate Q_D:

$Q_D = 6/8 - 14/8P_D$

$Q_D = 0.75 - 1.75P_D$

Plug Q_D into supply equation:

$3(0.75 - 1.75P_D) = 2 + 13P_S$

$2.25 - 5.25P = 2 + 13P$

$0.25 = 18.25P$

$P = 0.014$

Plug P into original demand equation

$8Q_D = 6 - 14(0.014)$

$8Q_D = 5.804$

$Q_D = 0.7255$

Exponents Overview

$x^3 = x * x * x$

$x^{-3} = 1/x^3$

$x^{(1/3)} = \sqrt[3]{x}$

$x^{(-3/4)} = 1/ \sqrt[4]{x^3}$