Closing Tue: 1.6(pt.2), 2.1
Exam 1 will be returned Tuesday.

1.6 (pt 2) - *Linear* Supply and Demand

A <u>supply curve</u> shows the relationship between market price, *p*, and the quantity, *q*, giving the ***quantity the manufacturers are willing to supply for that market price***.

A <u>demand curve</u> shows the relationship between market price, *p*, and the quantity, *q*, giving the ***quantity consumers are willing to purchase at that price***.

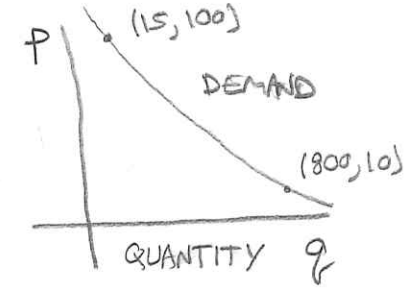
CONSIDER A GIVEN PRODUCT THAT YOUR COMPANY SELLS (OR A GIVEN INDUSTRY/PRODUCT).

DEMAND

- YOU TAKE DATA FROM MANY YEARS ON PRICE & ITEMS PURCHASED (OR YOU DO "MARKET RESEARCH" ASKING CONSUMERS WHAT PRICE THEY ARE WILLING TO PAY)

OBSERVATION: ↙ LOWER DEMAND
HIGHER PRICE ⇒ FEWER SOLD IN A YEAR

EX) $p = \$10 \Rightarrow q = 800$ } lower
$p = \$100 \Rightarrow q = 15$
QUANTITY DEMANDED



SUPPLY

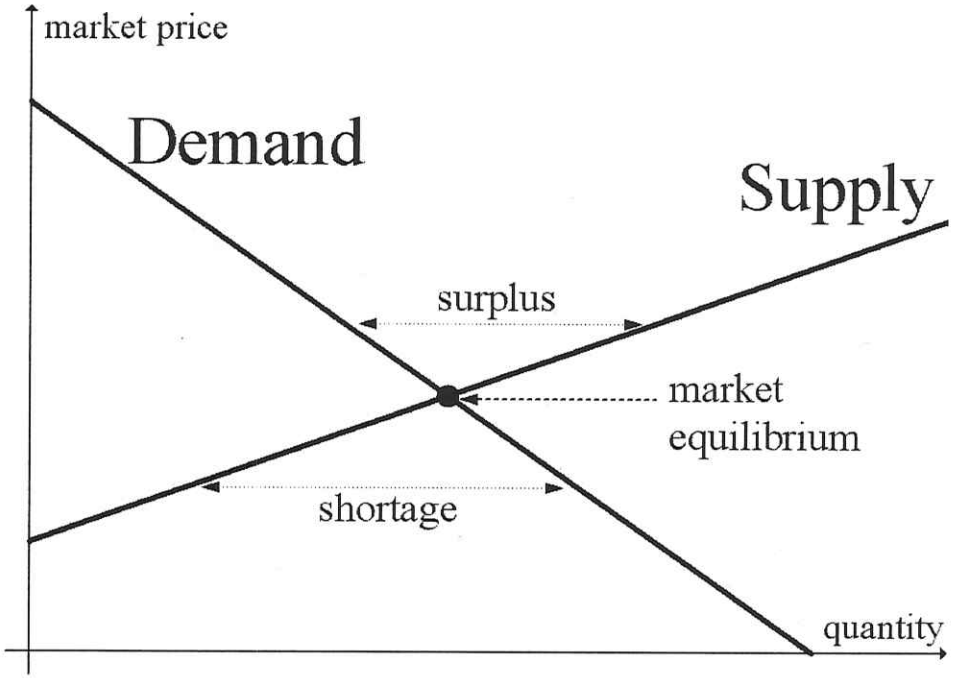
- THE SUPPLIER WANTS TO PRODUCE <u>MORE</u> IF SELLING PRICE IS HIGHER.

OBSERVATION: ↙ HIGHER SUPPLY
HIGHER PRICE ⇒ MORE PRODUCED

EX) $p = \$10 \Rightarrow q = 25$ } more
$p = \$100 \Rightarrow q = 900$
QUANTITY SUPPLIED

The Law of Supply:

The number of quantities manufacturers are willing to supply will increase as the market price goes up. (*i.e.* the supply curve will go up from left-to-right on the graph).



PRICE GOES UP ⇒ QUANTITY SUPPLIED GOES UP

PRICE GOES DOWN ⇒ QUANTITY SUPPLIED GOES DOWN

• SUPPLY IS AN INCREASING (UPHILL) FUNCTION!

The Law of Demand:

The number of quantities consumers are willing to purchase will decrease as the market price goes up. (i.e. the demand curve will go down from left-to-right on the graph).

PRICE GOES UP ⇒ QUANTITY DEMANDED GOES DOWN

PRICE GOES DOWN ⇒ QUANTITY DEMANDED GOES UP

• DEMAND IS A DECREASING (DOWNHILL) FUNCTION

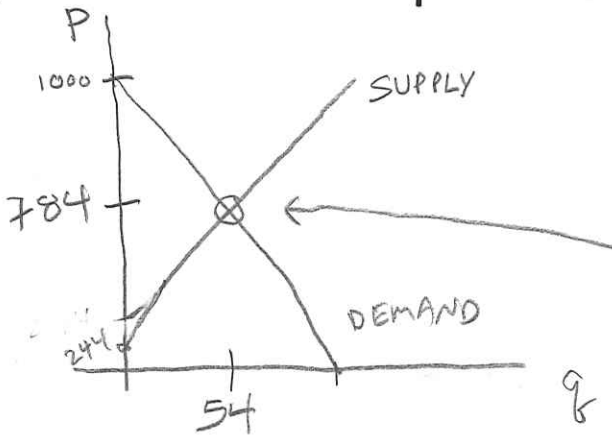
Example: Assume supply and demand are linear.

At a price of \$960, consumers will buy 10 items. At a price of \$600, consumers will buy 100 items.

At a price of \$344, suppliers willing to manufacture 10 items. At a price of \$1244, supplies are willing to manufacture 100 items.

(a) Find the linear equations for supply and demand.

(b) Find market equilibrium.



DEMAND $p = m(q - q_1) + p_1$

$(q, p) = (10, 960)$ & $(100, 600)$

SHOULD BE NEGATIVE

SLOPE $= m = \frac{960 - 600}{10 - 100} = \frac{360}{-90} = -4$

$p = -4(q - 10) + 960 = -4q + 40 + 960$

$\boxed{p = -4q + 1000}$ ← CHECK: (10, 960) works ✓ (100, 600) works ✓

SUPPLY $p = m(q - q_1) + p_1$

$(q, p) = (10, 344)$ & $(100, 1244)$

SHOULD BE POSITIVE!

SLOPE $= m = \frac{1244 - 344}{100 - 10} = \frac{900}{90} = 10$

$p = 10(q - 10) + 344 = 10q - 100 + 344$

$\boxed{p = 10q + 244}$ ← CHECK: (10, 344) ✓ (100, 1244) ✓

---

① $p = -4q + 1000$

② $p = 10q + 244$

} COMBINE!

① & ② $-4q + 1000 \stackrel{?}{=} 10q + 244$ $\quad -244, +4q$

$756 = 14q$

$q = \frac{756}{14} = 54$ ITEMS

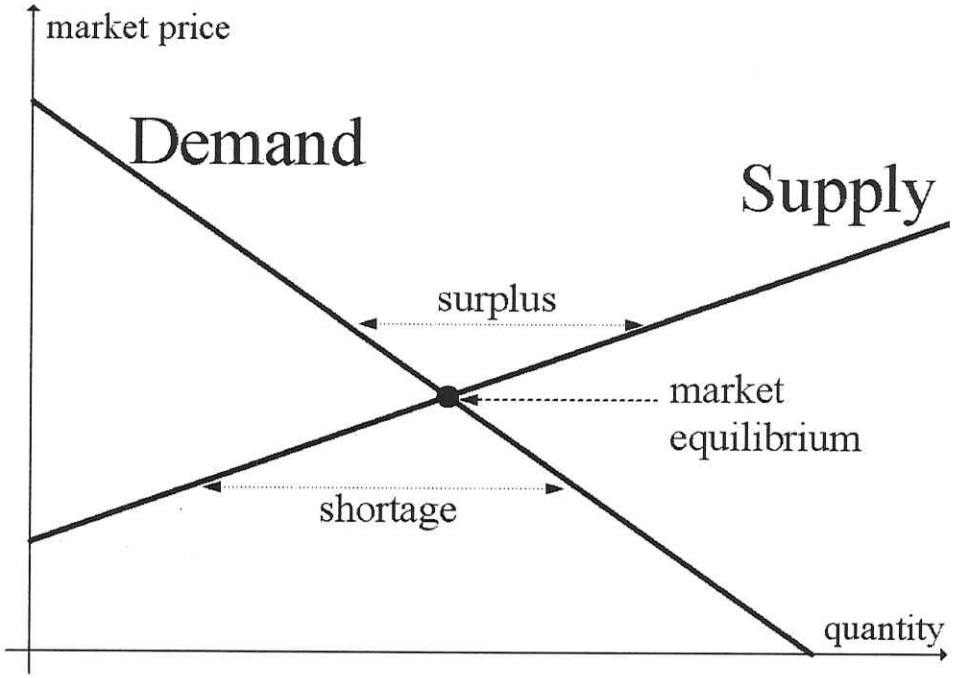
$p = -4(54) + 1000 = \$784$ ✓

$p = (0)(54) + 244 = \$784$ ✓

MARKET EQUILIBRIUM: $q = 54$ ITEMS, $p = \$784$

Market Equilibrium

The quantity and price at which supply and demand intersect is called **market equilibrium**. This gives the price at which the manufacturers and consumers are willing to produce and buy the same number of units.



If the market price is greater than market equilibrium, then there will be a **surplus** (more items will be produced than sold).

If the market price is less than market equilibrium price, then there will be a **shortage** (more items will be demanded than are produced).

In the last example, if the market price is set at \$800, then how many items are ***demanded*** and how many are ***supplied***. Will there be a surplus or shortage of items in the marketplace?

NOTE: $p = \$800 > \$784$ (MARKET EQUILIBRIUM)

DEMAND WILL GO DOWN
SUPPLY WILL GO UP
} SURPLUS

DEMAND

$p = -4q + 1000$

$800 = -4q + 1000$ $\quad -1000$

$-200 = -4q \quad \div -4$

$q = 50$ ITEMS DEMANDED

SUPPLY

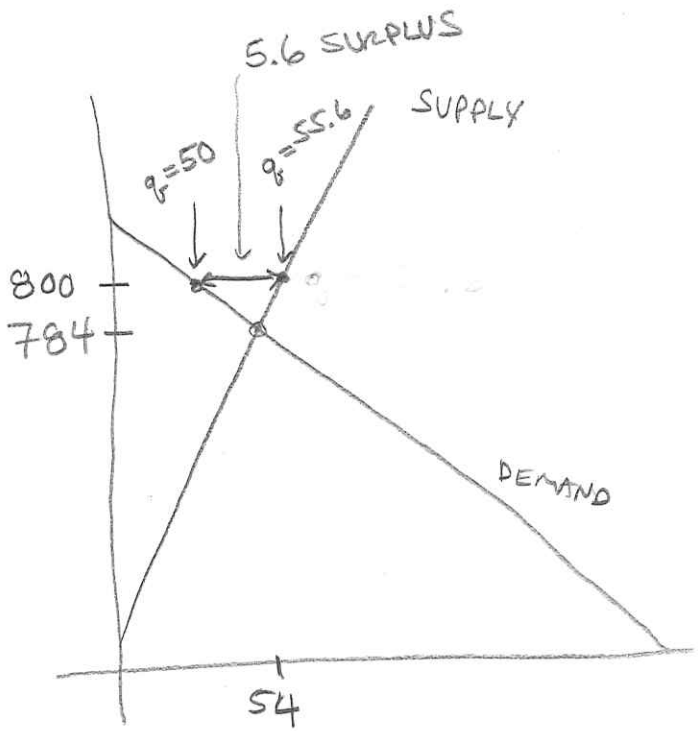
$p = 10q + 244$

$800 = 10q + 244$ $\quad -244$

$556 = 10q \quad \div 10$

$q = 55.6$ ITEMS SUPPLIED

≈ 56 ITEMS



$55.6 - 50 = 5.6$ SURPLUS

≈ 6 ITEM SURPLUS

Going back to our earlier example:

(this is just like the last HW question)

If the government levies a tax of $42 per item on the supplier and the supplier passes that on as a price increase the consumer, find the new market equilibrium.

This means the new equilibrium gives:

DEMAND PRICE = SUPPLIER PRICE + 42

Take your equations put them in a form to use this and solve!

DEMAND PRICE $= p = -4q + 1000$

SUPPLY PRICE $= p = 10q + 244$

NEW EQUILIBRIUM:

$$(-4q + 1000) \stackrel{?}{=} (10q + 244) + 42$$

$$-4q + 1000 = 10q + 286 \quad \text{(} -286, +4q \text{)}$$

$$714 = 14q$$

$$q = \frac{714}{14} = 51 \text{ ITEMS}$$

DEMAND PRICE $= p = -4(51) + 1000 = \$796$

WITHOUT TAX → OLD SUPPLY PRICE $= p = 10(51) + 244 = \$754$ (+42)

WITH TAX → NEW SUPPLY PRICE $= p = 10(51) + 286 = \$796$

NEW MARKET EQUILIBRIUM

$(q, p) = (51 \text{ ITEMS}, \$796)$