1.2 – Linear Functions & Applications

Math 111

Warnock - Class Notes

As a review from Math 91, remember that

$$f(x) = y = mx + b$$

Is a Linear Function in _____ - _____ form.

This is because _____ represents the _____ of the function and _____ represents the _____ of the function.

Supply & Demand

As the price of an item increases, buyers are _____ _____ to purchase that item. However, sellers are more likely to see a profit, so more attempt to sell it, so the _____ increases.

This increase in the supply, and decrease in the demand eventually leads to a _____, and then the price will _____. These forces tend to move the price, and the supply and demand to an _____ _____.

Cranberry Example

Even though price is the _____ variable here, economists have the poor habit of plotting price on the vertical axis, so we will abide by that. (Thanks to Alfred Marshall – 1841-1924). Remember though, that it is _____ that determines how much consumers demand and producers supply, not the other way around.

#1. **Suppose that the demand and price for strawberries are related by**

$$p = D(q) = 5 - 0.25q$$

where *p* is the price (in dollars) **and *q* is the quantity demanded** (in hundreds of quarts).

a) **What does this mean if the price was $5?**

b) **What would the demand be if the price was $4?** **$2?**

c) **What would the price be if the demand is 840 quarts?**

It is also true that the quantity of strawberries supplied will _____ as the price decreases. Suppose the Price p and supply q are related by the linear function

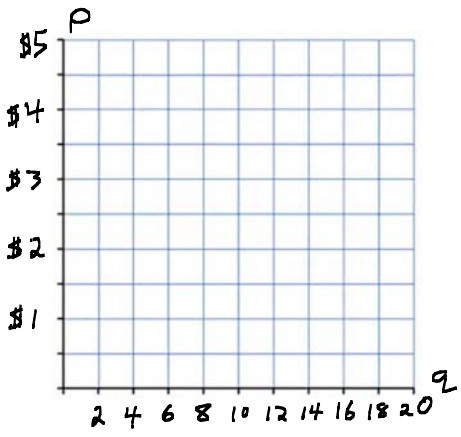
$$p = S(q) = 0.25q$$

d) **How much would be supplied if the price was $4?** **$2?**

e) **Comparing your answers to b) and d), what will ultimately happen if the price is $4?**

f) **What would ultimately happen if the price was $2?**

g) **Graph both functions S and D.**

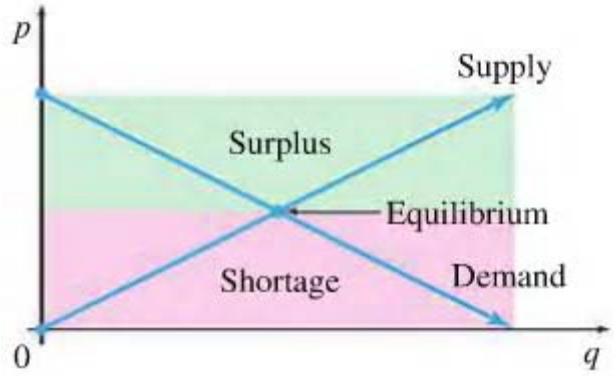


The point where the graphs intersect is called the _____.

When the Strawberries were priced at $4, there was a _____.

When the Strawberries were priced at $2, there was a _____.

Here is a picture of this.



So $2.50 is called the _____ _____.

and 1000 quarts is called the _____ _____.

h) Use Algebra to find the equilibrium quantity and price for the Strawberries.

#2. **If the demand function is** $D(q)=10-0.85q$ **and supply is** $S(q)=0.4q$**, find the Equilibrium Quantity and Price.**

Cost Analysis & Break-Even Analysis

When manufacturing an item, there are typically two groups of costs associated.

First we have _____ _____ which would include designing the product, setting up a factory, training workers, etc. This typically doesn't depend on the number of items being made.

Second, we have _____ ____ _____ for labor, materials, packing, shipping, etc. This does depend on the number of items made.

#3. A small company decides to produce Smartphone covers (pick your favorite). They find that the fixed cost for creating these covers is $2500, after which they must spend $3.25 to produce each individual cover. Find a formula $C(x)$ for the cost as a linear function of *x*, the number of covers produced.

The $3.25 per cover is called the _____ ___ _____ of the Cost function, and in Economics this is called the _____ _____. This approximates the cost of producing one additional item.

So if our cost function is $C(x)=mx+b$, the fixed cost is ____ and the marginal cost is ____.

The _____ from selling *x* units of an item is the product of the price per unit *p* and the number of unit sold (demand) *x*.

$$R(x)=$$

Then _____ is the difference of _____ _____ and _____ _____. That is

$$P(x)=$$

The number of units where $R(x)=C(x)$ is called the _____ _____ _____.

#4. **Alfred Juarez owns a small publishing house specializing in Latin American poetry. His fixed cost to produce a typical poetry volume is $525, and his total cost to produce 1000 copies of the book is $2675. His books sell for $4.95 each.**

a) **Find the linear Cost function for Alfred's book production.**

b) **Find the Revenue Function for Alfred's book sales.**

c) **What's the Profit Function for Alfred's publishing house?**

d) **How many poetry books must he produce and sell in order to break even?**

e) **How many books must he produce and sell to make a profit of $1000?**

See page 22 to cover Temperature on your own – there's a HW question on it.