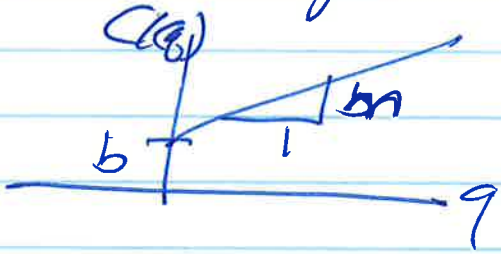
Review

Applications of functions to economics

The Cost Function total cost of producing a quantity q of some good

(Linear for now)

$C = mq + b$



m - marginal cost

b - fixed cost

q can't be negative hence graph starts at $q = 0$

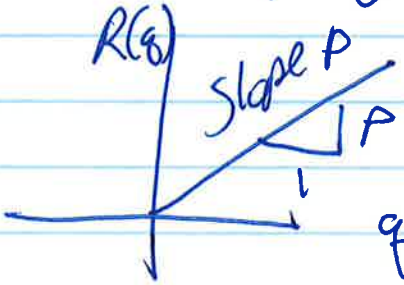
m - marginal cost

slope of cost function

cost to produce one more unit of good

Revenue Function total revenue from selling a quantity q of some good

$R(q) = pq$ where p is price of good

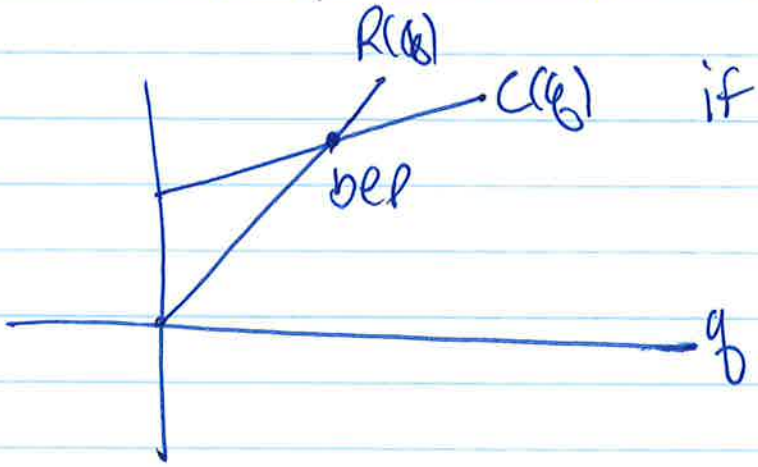


p is the marginal revenue

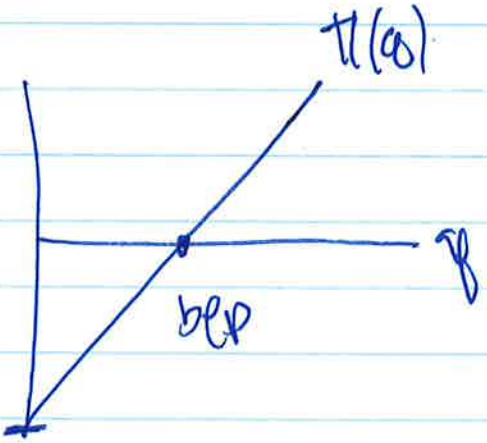
vertical intercept, $= 0$.

Profit function Profit = Revenue − Cost

$$\Pi(q) = R(q) - C(q)$$



if R and C look like this

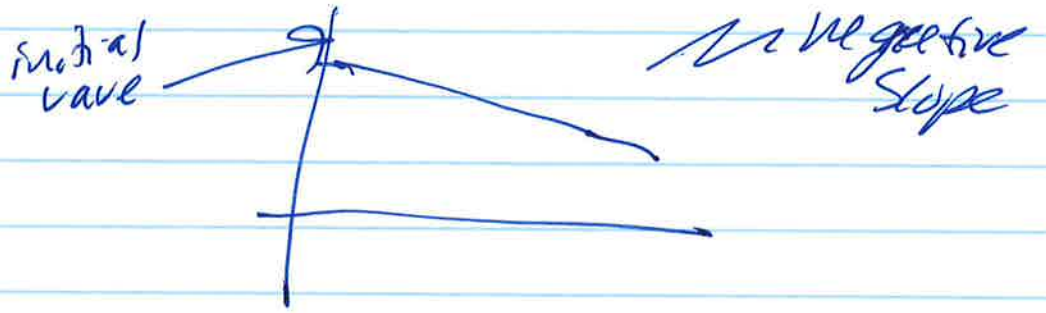


Π looks like this

Depreciation Function $V(t)$

Value of machinery as a function of time (as it loses its value)

Also linear for now



New: Supply and demand curves

The supply curve relates the price of a good to the amount suppliers are willing to produce

(typically as the price goes up suppliers are willing to supply more)

The demand curve relates the price of a good to the amount consumers are willing to consume.

(typically as price goes up consumers are willing to consume less) Not always though (t-shirts at rock concerts) But as far as we/our book is concerned, this pathology doesn't happen.

Now we have quantity and price which do we put on vertical axis and which do we put on horizontal axis?

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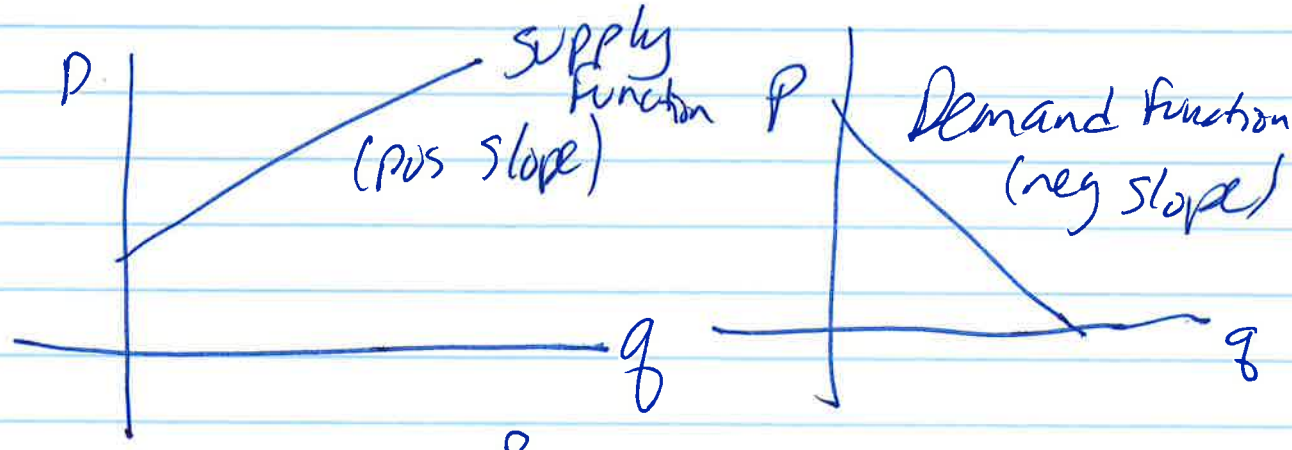
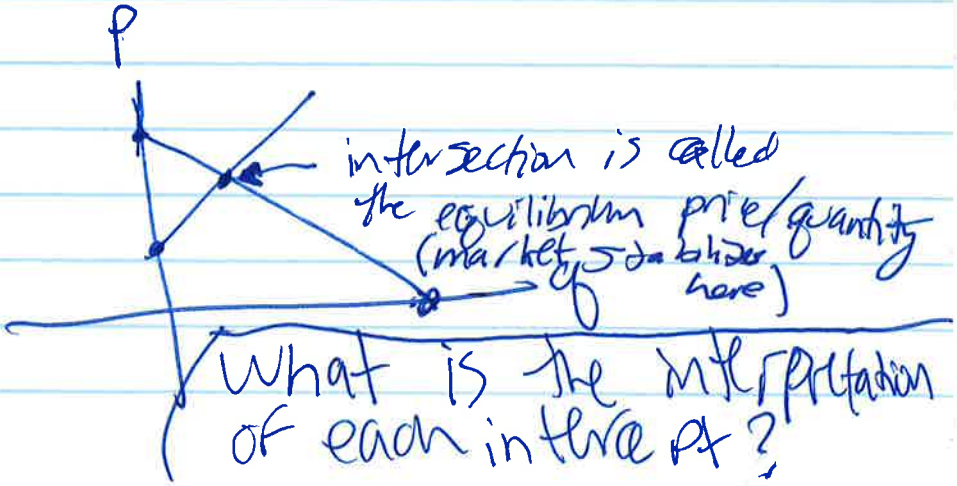
Price is the "independent" variable so it would make sense to put it on the horizontal axis,

However for historical reasons this isn't done. Price is put on vertical axis Quantity on ~~vertical~~ horizontal axis

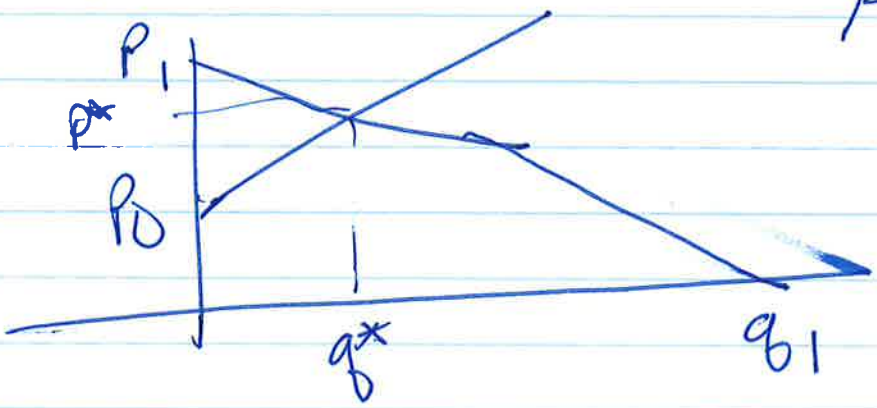
CONFUSING! Some times price=function(quantity) and sometimes quantity = function(price) it is written both ways so beware But no matter how it is written it is graphed the same way



Usually graphed on same axis



What is the interpretation of specific points?



or,

p_1 – price that's too high for consumers (zero quantity demanded at or above this price)

supply meets demand

p^* – equilibrium price – price where market stabilizes

p_0 – price that's too low for suppliers (zero quantity supplied at or below this price)

q^* – equilibrium quantity – quantity supplied when market is in equilibrium where market stabilizes

q_1^* – amount demanded by consumers when good is free.

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How do you find equilibrium price

$q_s = 3p - 50$ supply

$q_d = 100 - 2p$ demand

[?]

$q_s^* = q_d^*$

$3p^* - 50 = 100 - 2p^*$

$5p^* = 150$

$p^* = 30$

$q^* = 3p^* - 50 = 90 - 50 = 40$

check $= 100 - 2p^* = 100 - 2 \cdot 30 = 40$ ✓

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The effect of taxation on equilibrium

Supply curve: $3p-50=q$
Demand curve: $100-2p=q$

\$5 tax per unit (specific tax)
imposed on consumer.

consumer pays \$5 more

Replace demand curve with $q=100-2p$ with $q=100-2(p+5)$

Keep supply curve the same $3p-50=q$

now solve for equilibrium

What if imposed on supplier

Replace supply curve $q=3p-50$ with $q=3(p-5)-50$

supplier getting \$5 less

Keep demand curve $q=100-2p$

Solve for equilibrium

What about a 5% sales tax on consumer (rather than a $5 specific tax.)

Consumer pays Five percent more

demand curve

$$q = 100 - 2(1 + 0.05)p$$

same supply

$$q = 3p - 50$$

Solve for equilibrium

What about a 5% subsidy given to suppliers

Supply curve

$$q = 3(1 + 0.05)p - 50$$

Same demand

supplier gets 5% more

5% tax on supplies

Same demand

$$q = 3(1 - 0.05)p - 50$$

Math 211-20155-W2-Tues

Budget constraint

You have $12,000 to spend on guns and butter.

Each gun costs $400. You buy g guns.
Each ton of butter costs $2000. You buy b tons.

Amount spent on guns is $400g$ dollars
Amount spent on butter is $2000b$ dollars

Constraint is

$$400g + 2000b = 12000$$

$$\frac{}{400 \qquad 400 \qquad 400}$$

$$g + 5b = 30 \quad / \quad g = -5b + 30$$

$$0 = -5b + 30$$
$$b = 6$$