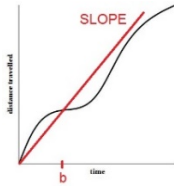


RATES OF CHANGE

Distance Functions $d(t)$

TRIP SPEED

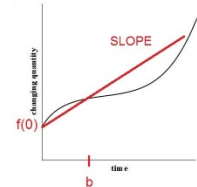
$$\frac{d(b) - d(0)}{b - 0} = \frac{d(b)}{b}$$



Other Functions $f(t)$

OVERALL RATE OF CHANGE

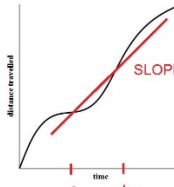
$$\frac{f(b) - f(0)}{b - 0} = \frac{f(b) - f(0)}{b}$$



$t=0$ to $t=b$

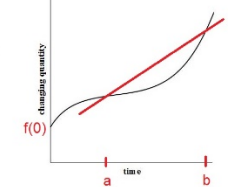
AVERAGE SPEED

$$\frac{d(b) - d(a)}{b - a}$$



AVERAGE RATE OF CHANGE

$$\frac{f(b) - f(a)}{b - a}$$



$t=a$ to $t=b$

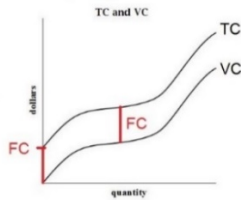
PRODUCING AND SELLING THINGS

Total Cost is made up of Variable Cost and Fixed Cost.

$$TC(q) = FC + VC(q)$$

$$FC = VC(0)$$

$$0 = VC(0)$$

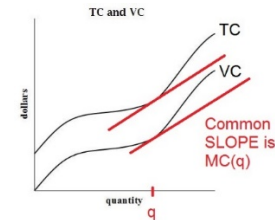


Marginal Cost at q is the cost of producing the $q+1^{st}$ thing having already produced q items.

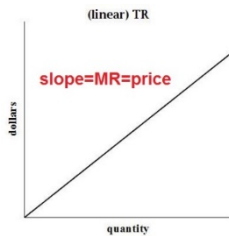
$$MC(q) = TC(q+1) - TC(q)$$

$$= \frac{TC(q+1) - TC(q)}{(q+1) - q}$$

It can also be calculated using VC.



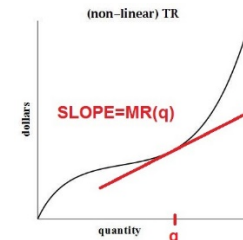
$TR = \text{Price} \times \text{Quantity}$
If the price p is constant, then $TR=pq$ will be a line through the origin with slope p .



If price is not constant, TR is not linear. Then, Marginal Revenue is:

$$MR(q) = TR(q+1) - TR(q)$$

$$= \frac{TR(q+1) - TR(q)}{(q+1) - q}$$

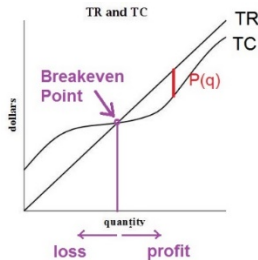


Profit is the difference between Revenue and Cost:

$$P(q) = TR(q) - TC(q)$$

We break even when

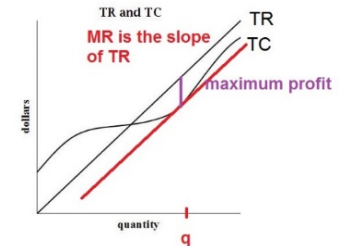
$$TR(q) = TC(q)$$



When $MR > MC$, profits go up, when $MR < MC$, profits go down. The maximum profit happens at the quantity when

$$MR(q) = MC(q)$$

and $TR > TC$ so you have a profit and not a loss.

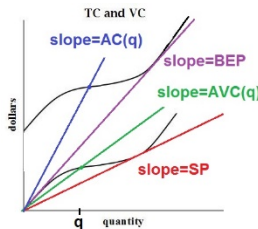


Average Cost and Average Variable Cost:

$$AC(q) = \frac{TC(q)}{q}$$

$$AVC(q) = \frac{VC(q)}{q}$$

Breakeven Price (BEP) is the lowest value of AC. Shutdown Price (SP) is the lowest value of AVC.



We can calculate TC : and VC

$$TC(q) = q \times AC(q)$$

$$VC(q) = q \times AVC(q)$$

BEP is when $MC=AC$.

SP is when $MC=AVC$.

Profit is maximized when $MR=MC$, when you switch from $MR > MC$ to $MR < MC$.

