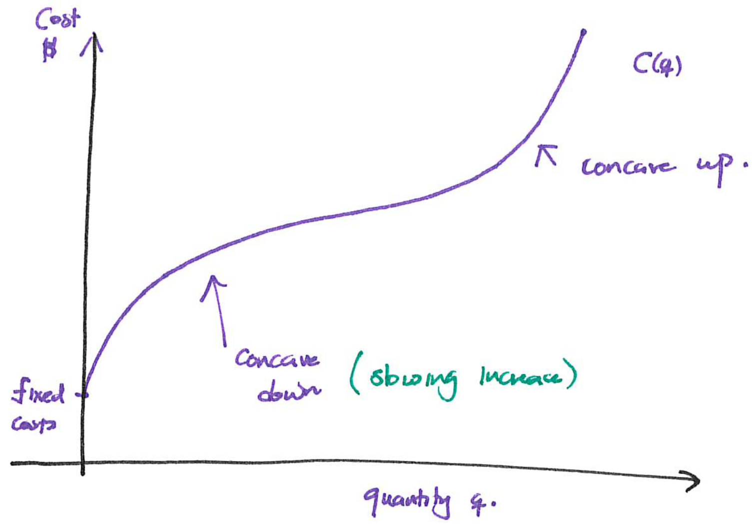
# Marginal Cost & Revenue

Ⓐ COST

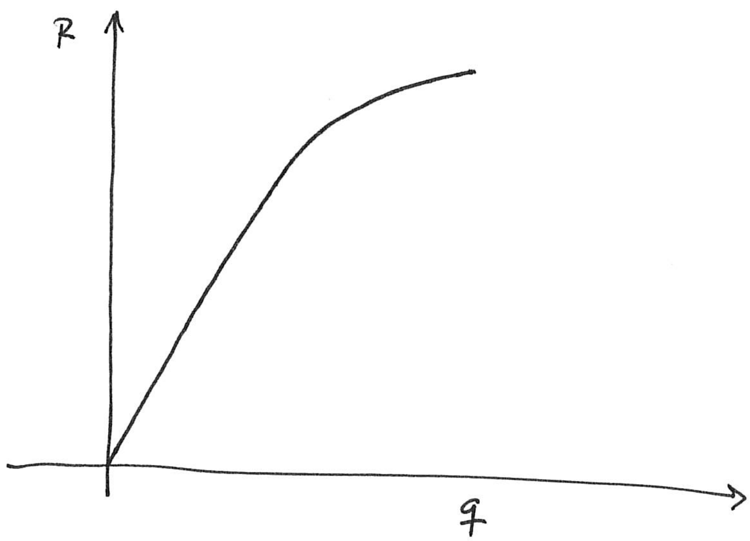



In practice cost functions are not linear, instead

* They increase quickly at first, then slow down because producing more goods is more efficient (economies of scale)

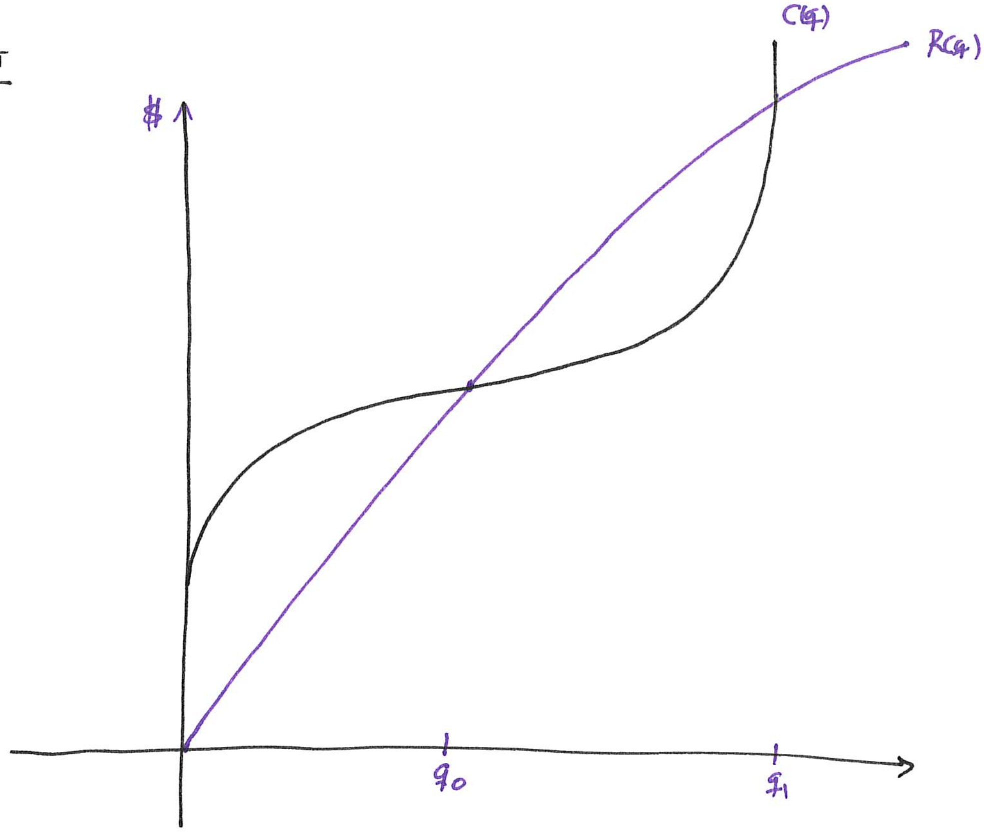
** At larger production quantities, costs increase faster e.g 1. New equipment
2. New factory.

Ⓑ Revenue




Increasing production causes a glut in the market forcing prices down

## PROFIT



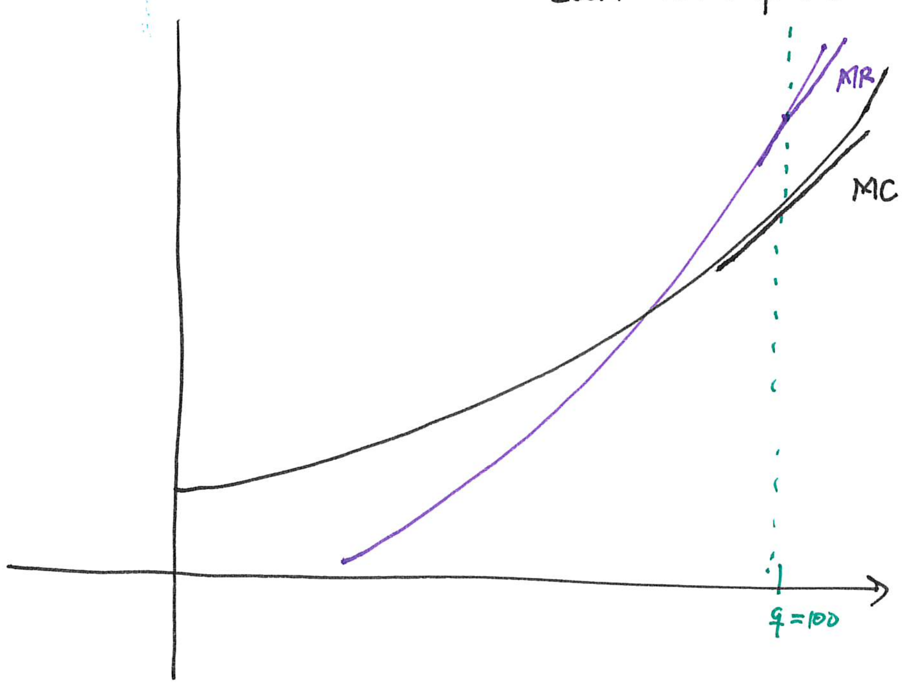

We still want $R(q) > C(q)$ so the manufacturer must produce at some point $q_0 < q < q_1$, but what point exactly?

**Marginal analysis** (Initialy Delta offers 100 flights per day)

Suppose Delta wants to decide wheather to offer additional flights.

How do they decide?

Zoom around $q = 100$




We analyze $MC(100)$ and compare to $MR(100)$

$MC(100) = C'(q)$ - the instantaneous rate of change w.r.t $q$ (slope of cost function)

$MR(100) = R'(q)$ - slope of revenue function.

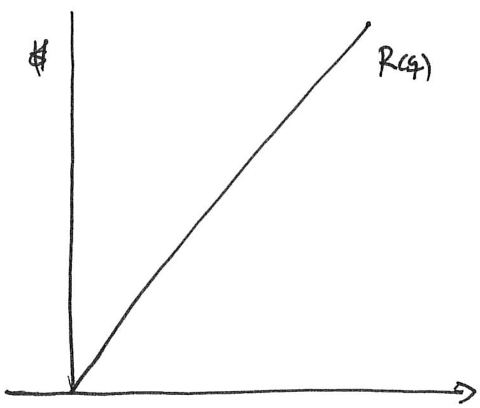
Since @ $q = 100$, $MC < MR$, the airline should add one more flight.

$$\boxed{\begin{array}{l} \underline{\text{In general}} \\ \text{① Marginal cost (MC)} = C'(q) \quad \text{so} \quad \text{Marginal Cost} \cong C(q+1) - C(q) \\ \text{② Marginal revenue (MR)} = R'(q) \quad \text{so} \quad \text{Marginal Revenue} \cong R(q+1) - R(q) \end{array}}$$

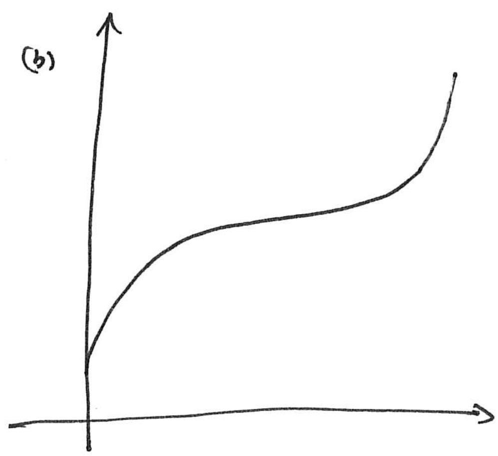
## Graphs

Suppose

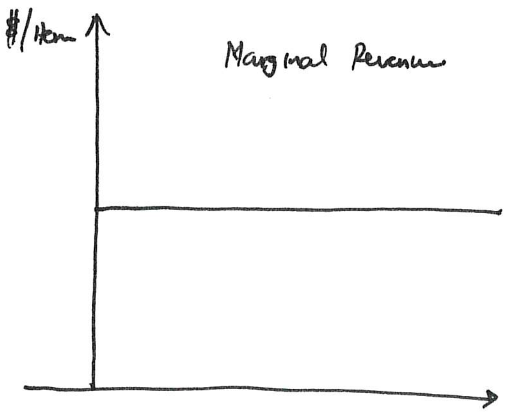
(a)

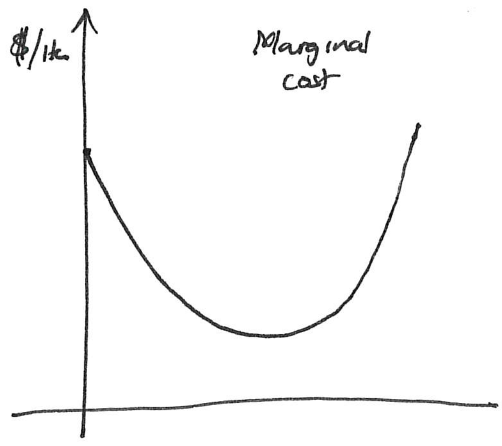



(b)



the Marginal graphs



# Decision making and derivatives

~~The~~ A company's revenue from car sales is $R = f(a)$ is a function of advertising expenditure, $a$ in thousands of dollars

(a) What does the company hope to be true about the sign of $f'$

(b) Suppose the company plans to spend \$100,000 on advertising
If $f'(100) = 2$, should the company spend more or less?
What if $f'(100) = 0.5$?

(a) $f'(a) > 0$ – increased advertising brings in more customers $\Rightarrow$ more revenue

(b) $f'(100) = 2$ means if the advertising budget is \$100,000, an extra dollar spent on advertising will bring in \$2 in sales.

$f'(100) = 0.5 \Rightarrow$ an extra dollar spent on advertising above \$100,000 brings in 50c.

* If $f'(a) > 1$ spend more otherwise too much is being spent!