HW 5 Due Tonight

HW 6 Due March 7

You should go over the problems before the exam

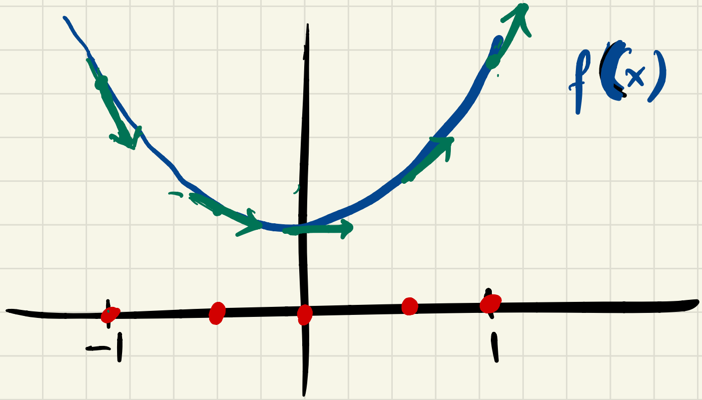
Midterm 2 March 4, Thursday

Sample Test Problems Due March 4 midnight

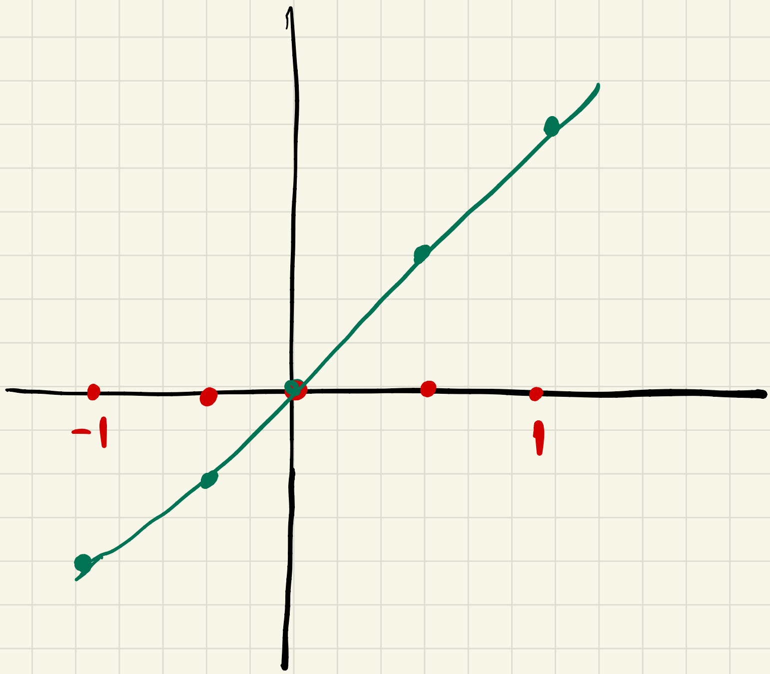
Upload to Moodle

Tuesday In-person class (Half of you can stay)

You can come to collect your Midterm 1.



Me



$f(x) = \ln x$

size $\underline{0.1}$

$f'(1)$

$f'(1) \approx$ Average rate of change from 1 to 1.01

$$= \frac{f(1.01) - f(1)}{1.01 - 1}$$

$$= \frac{\ln(1.01) - \ln(1)}{0.01}$$

$$= \boxed{0.9950}$$

Avg. rate of change from $x=a$ to $x=b$ $= \dfrac{f(b) - f(a)}{b - a}$

size 0.01 better estimate for $f'(1)$

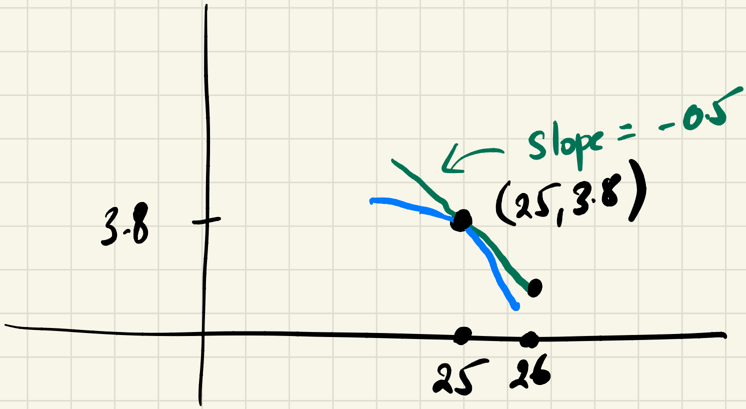
- - -

$f(t)$

$f(25) = 3.8$

$f'(25) = -0.5$

Estimate $f(26)$. $f(29)$



Assume that the graph looks like the tangent line after 25.

Equation of tangent.

Point slope form

Point $(x_0, y_0) = (25, 3.8)$

Slope $= -0.5$

Eq: $y - y_0 = m(x - x_0)$

$$y - 3.8 = -0.5(x - 25)$$

Plug in $x = 26$ into above equation.

$$y - 3.8 = -0.5(26 - 25)$$

$$y - 3.8 = -0.5(1)$$

$$y - 3.8 = -0.5$$

$$y = 3.8 - 0.5$$

$$y = 3.3$$

Estimate for $f(26)$ is $\boxed{3.3}$

2.5. Marginal Cost and Revenue

Recall:

Ex. A business owner sells T-shirts. He buys the tshirt for \$ 10 per unit and sells them for \$ 20 per unit. He spends \$ 10,000 to open up his shop.

Cost = Fixed cost + Variable Cost

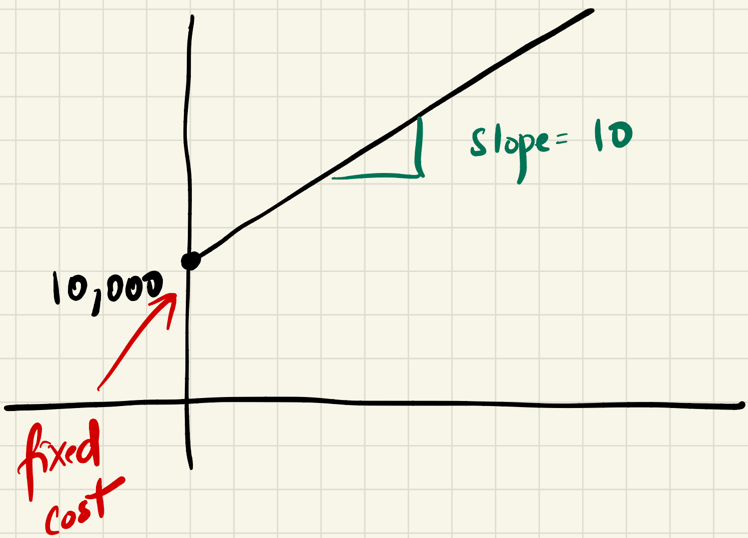
$$C(q) = 10,000 + 10q$$

(q quantity)

$y = mx + b$

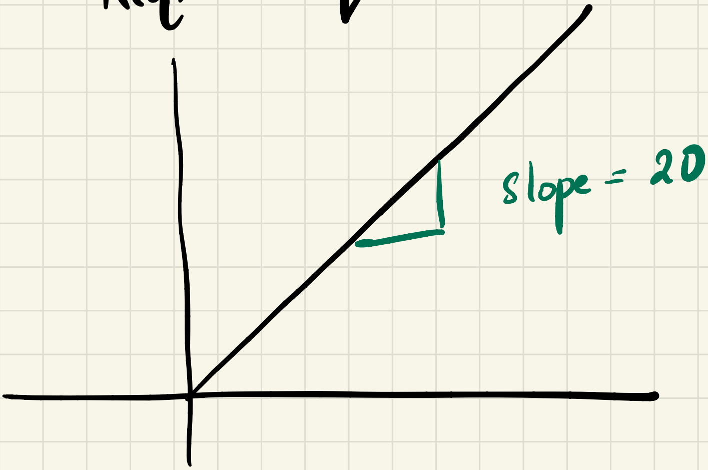
$m = 10$

$b = 10,000$



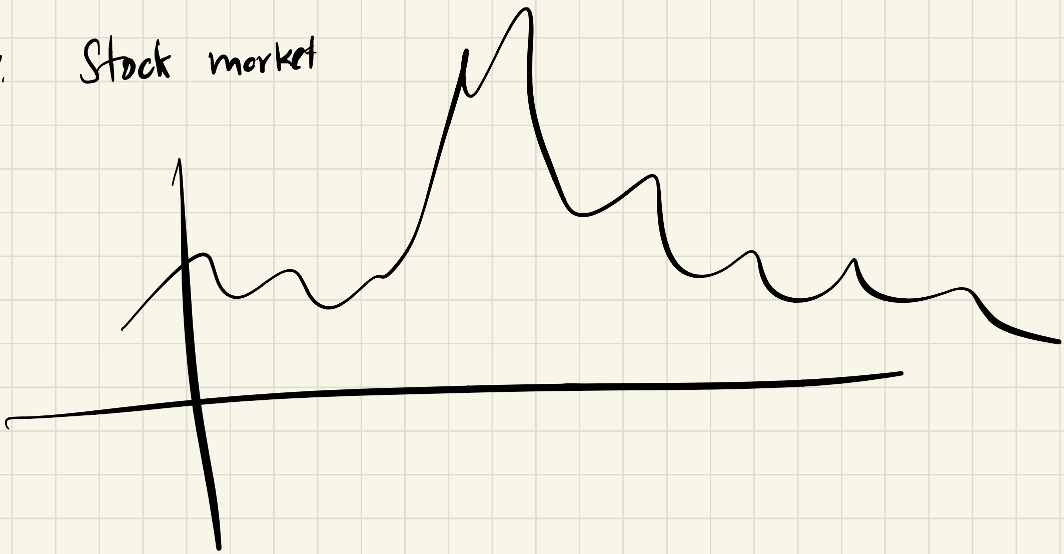
Revenue

$R(q) = 20q$



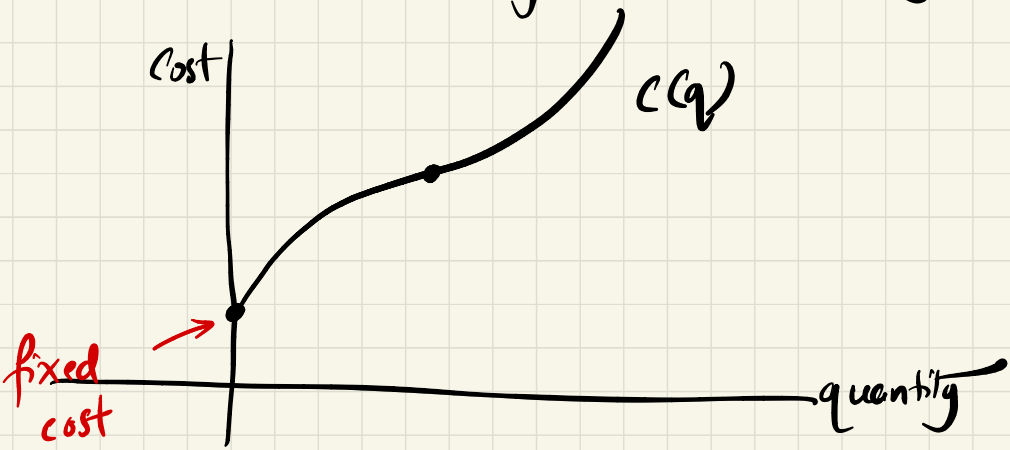
In real world economics, things are not so simple. Functions are not linear as price fluctuates.

Ex. Stock market



In the example

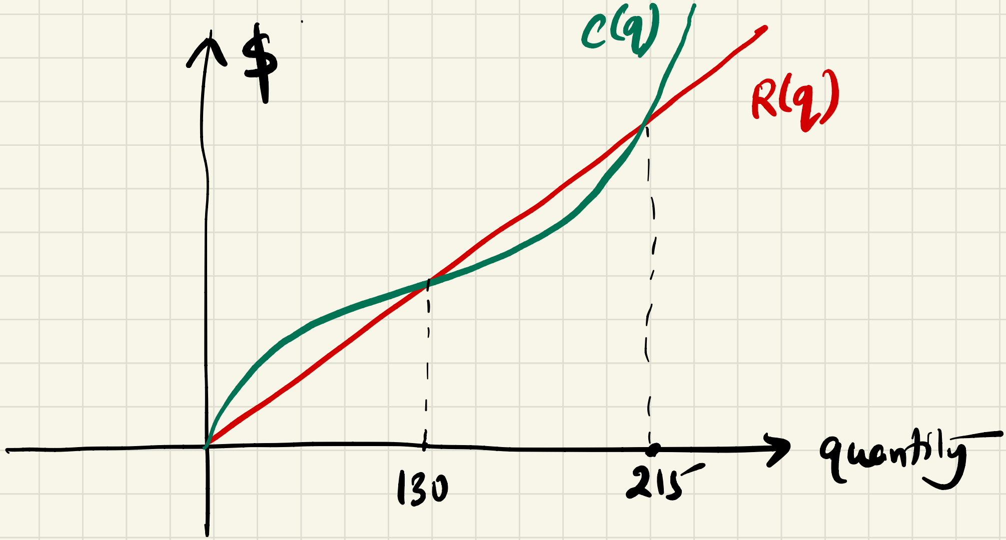
As production increases, the resources might be scarce and the cost might increase sharply.



Revenue:

As quantity increases, the demand might decrease and the price might drop.

Ex.



For what production quantity does the firm make profit?

Soln. In order to make profit,

Revenue > Cost

From 130 to 215, the ~~com~~ firm makes profit.

Morginal Analysis

Suppose you hove an airline business.
You are trying to deode whether to offer an additional flight.
How do you deide?
You have Analyze the additsonal cost vs. additional revenue.

Crucial question : Is the additional cost greater or smaller than the additional revenue?

If the airline had originally planned to run 100 flights, the cost would be $c(100)$.
With the additional flight the cost would be $c(101)$.

Additional cost "at the margin" $= c(101) - c(100)$

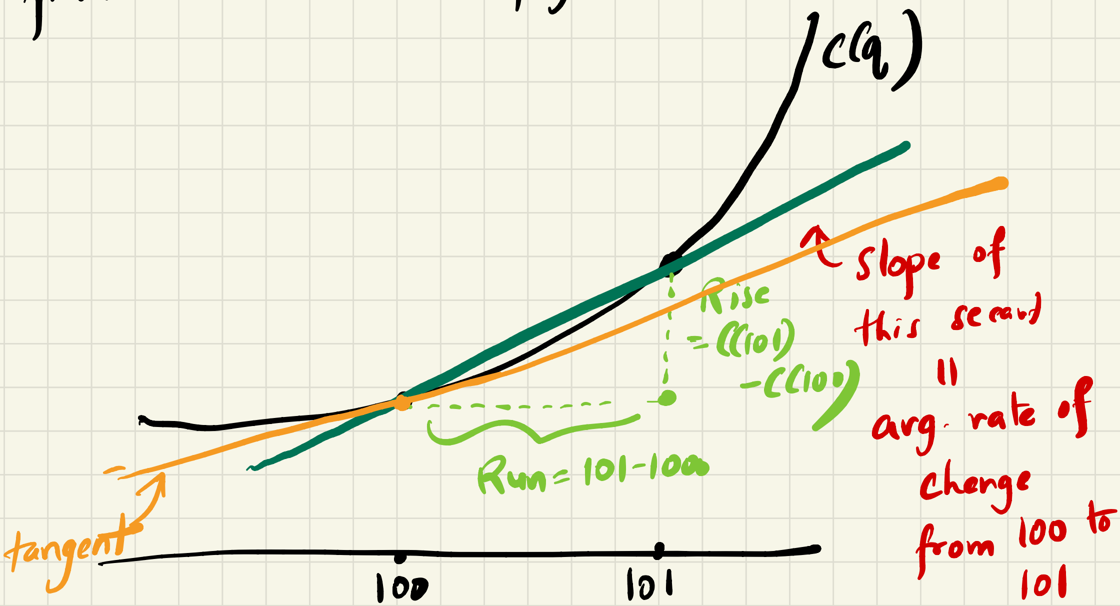
cost for adding the 101^{st} flight

$$= \frac{c(101) - c(100)}{101 - 100}$$

$101 - 100 = 1$

$$\frac{C(101) - C(100)}{101 - 100}$$

This is just the average rate of change of $C(q)$ from 100 to 101. flights.



$$\frac{C(101) - C(100)}{101 - 100}$$

If the cost function is not curving too fast near 100, then the slope of this secant line (avg. rate of change) is close to the tangent at $(100, C(100))$

ECONOMISTS CHOOSE TO DEFINE THE MARGINAL COST MC AS THE INSTANTANEOUS RATE OF CHANGE OF COST, I.E. THE DERIVATIVE OF COST FUNCTION.

$\boxed{\text{Marginal cost (MC)} = C'(q)}$ derivative of cost function at q ✓

Note that

$$MC \neq C(q+1) - C(q)$$

(In the example $MC \neq C(101) - C(100)$)

but, $MC \approx C(q+1) - C(q)$

approximately

Similarly, if the number of flights increases from 100 to 101,

Additional revenue "at the margin" $= R(101) - R(100)$

Revenue for adding 101^{st} flight

$$= \frac{R(101) - R(100)}{101 - 100} = 1$$

Average rate of change of $R(q)$ from 100 to 101.

$\boxed{\text{Marginal Revenue (MR)} = R'(q)}$

derivative of revenue function at q

Note $MR \neq R(q+1) - R(q)$

but, $MR \approx R(q+1) - R(q)$