

How can Calculus make us money?

Income/Revenue: \$ from sales
- Cost/Expense:

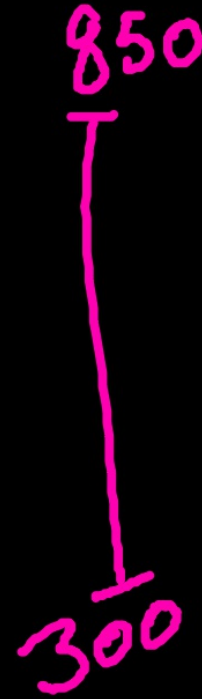
Profit

Jeff
Bezos

~ \$90bn

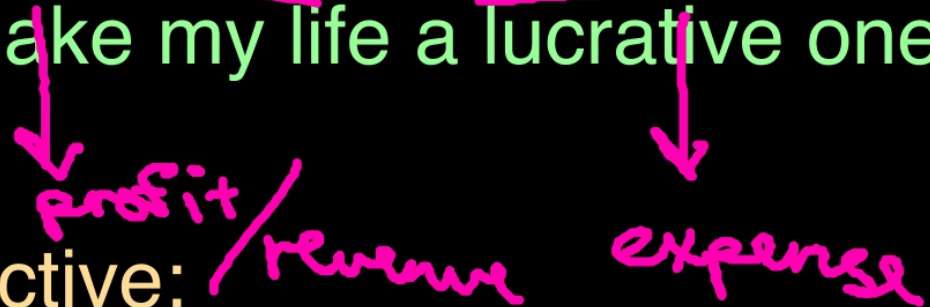
profit

revenue



Today's learning objective:

By the end of class, I will be able to practically apply calculus to maximisation and minimisation problems in order to make my life a lucrative one.



Today's language objective:

Maximise
Minimise
Revenue
Income
Cost
Expense
Profit

If you were to create a business with a product or service...

loss-leader

- 1.) What would you sell?
- 2.) How much would you sell it for on a per-unit basis?
- 3.) What would your profit be on a per-unit basis?

At a basic level, how do businesses make money?

A small manufacturing company makes and sells x machines each month. The monthly cost C , in dollars, of making x machines is given by

$$C(x) = 2600 + 0.4x^2.$$

The monthly income I , in dollars, obtained by selling x machines is given by

$$I(x) = 150x - 0.6x^2.$$

$P(x)$ is the monthly profit obtained by selling x machines.

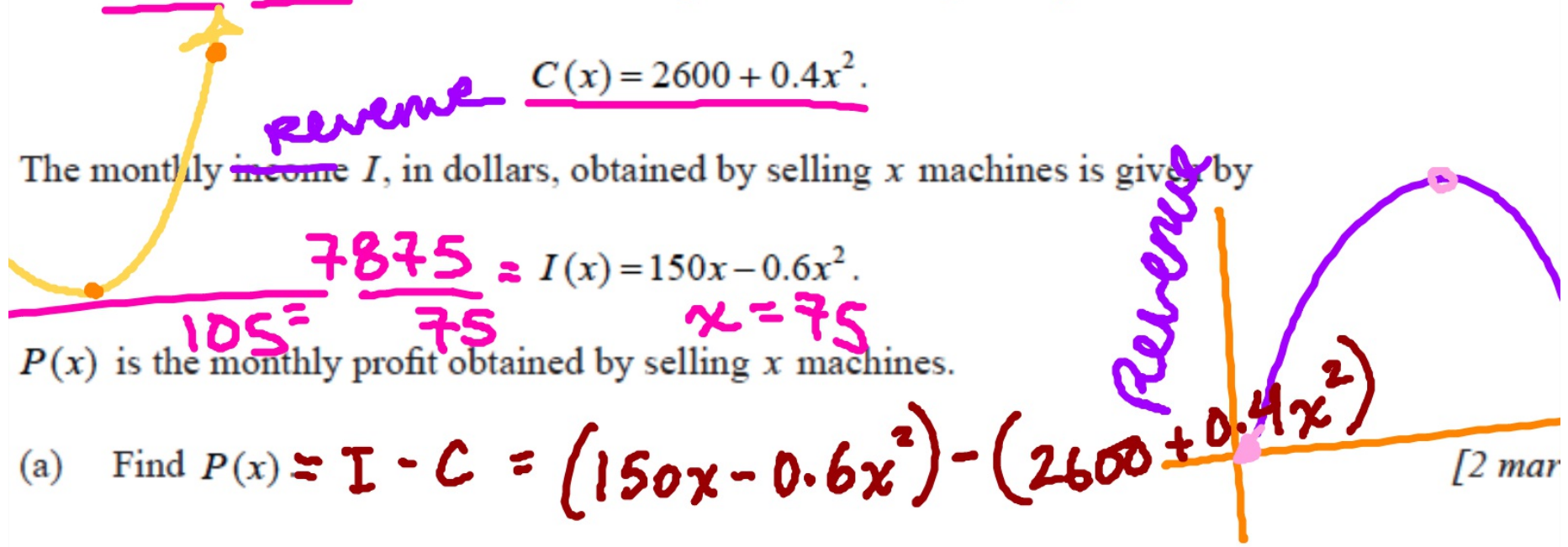
(a) Find $P(x) = I - C = (150x - 0.6x^2) - (2600 + 0.4x^2)$ [2 mar]

(b) Find the number of machines that should be made and sold each month to maximize $P(x)$ [2 mar]

$$P(x) = 150x - x^2 - 2600$$

$$P'(x) = 150 - 2x = 0 \quad \boxed{x = 75}$$

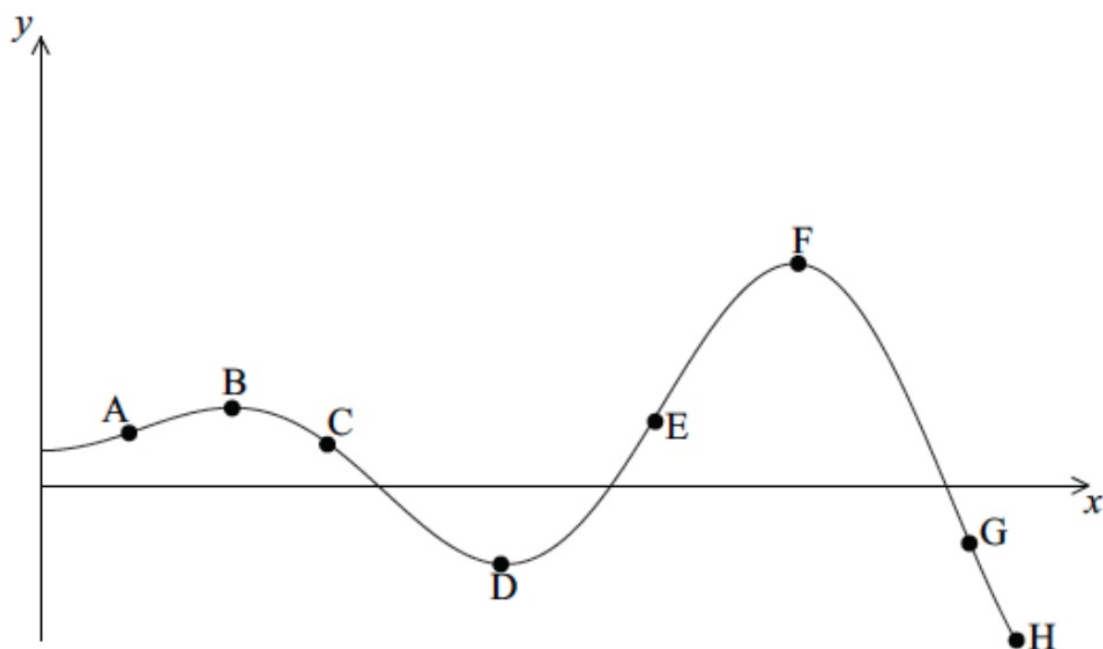
(c) Use your answer to part (b) to find the selling price of each machine in order to maximize $P(x)$. [2 mar]



A quick review of the unit so far...

- *Graphs of derivatives
- *Normals
- *2nd derivatives
- *Equations of tangents

Consider the graph of the function $y = f(x)$ defined below.



What is the value of $f'(x)$ at points B, D and F?

What is the value of $f'(x)$ to the left of B, D, and F?

Consider the curve $y = x^2$.

[Non-calc]

(a) Write down $\frac{dy}{dx}$.

The point P(3, 9) lies on the curve $y = x^2$.

(b) Find the gradient of the tangent to the curve at P.

(c) Find the equation of the normal to the curve at P. Give your answer in the form $y = mx + c$.

(d) Does point P correspond to a minimum or maximum?

This is the graph of $f'(x)$

