

CRITICAL / STATIONARY POINTS

$$f'(x) = 0$$

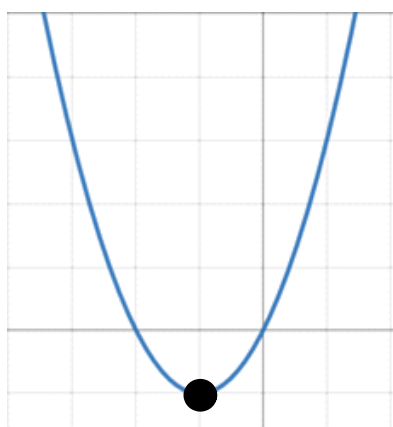


Firstly, think about the word stationary... it means not moving.

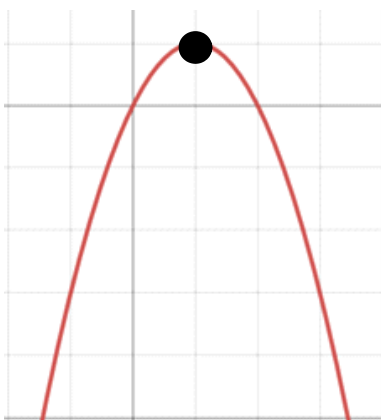
A stationary point, commonly also referred to as a critical point, is a point on a function in which the **gradient at that point is equal to zero**.

In other words, a point on a function in which the **gradient function / derivative is equal to zero** ($f'(x) = 0$)

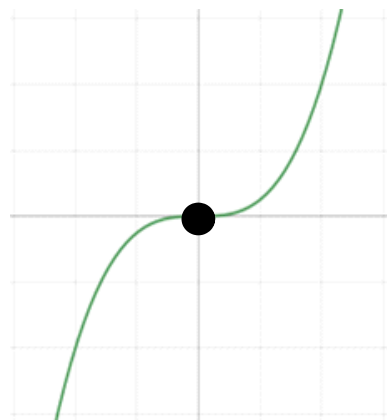
Three types (nature of the critical point)



**Minimum
(MIN)**



**Maximum
(MAX)**



**Horizontal Point of Inflection
(HPOI)**

Finding critical points (example)

Find the co-ordinates for ALL critical points of the function $f(x) = \frac{x^3}{3} - 3x^2 + 8x + 2$

$$\begin{aligned} f'(x) &= x^2 - 6x + 8 = 0 \\ (x - 2)(x - 4) &= 0 \\ x &= 2 \text{ or } x = 4 \end{aligned}$$

$\Rightarrow$ Set $f'(x) = 0$ to solve for critical points
 $\Rightarrow$ Factorise to use null factor theorem
 $\Rightarrow$ x values for critical points found

$$f(2) = \frac{26}{3} \text{ and } f(4) = \frac{22}{3}$$

$\Rightarrow$ Substitute x values into $f(x)$ to give coordinates

Points $\left(2, \frac{26}{3}\right)$ and $\left(4, \frac{22}{3}\right)$ are the critical points



@TheMathDugout