

Stationary Points Quiz Answers

$$\textcircled{1} \quad y = x^2 - 7x + 12$$

$$\frac{dy}{dx} = y' = 2x - 7$$

Stationary pts occur when $y' = 0$

$$0 = 2x - 7$$

$$7 = 2x$$

$$\frac{7}{2} = x$$

$$x = 3.5$$

$$y = x^2 - 7x + 12$$

$$y = 3.5^2 - 7 \times 3.5 + 12$$

$$y = -0.25$$

$$\text{point} = (3.5, -0.25)$$

test whether this is a max/min/p.o.i.

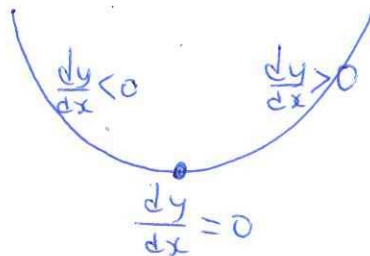
$$\text{if } x = 3, \quad \frac{dy}{dx} = 2x - 7 = 2 \times 3 - 7 = 6 - 7 = -1$$

$$\frac{dy}{dx} < 0$$

$$\text{if } x = 4, \quad \frac{dy}{dx} = 2x - 7 = 8 - 7 = +1$$

$$\frac{dy}{dx} > 0$$

Hence this is a minimum at $(3.5, -0.25)$



$$\textcircled{2} \quad y = x^3 - 12x + 4$$

$$\frac{dy}{dx} = 3x^2 - 12$$

stationary points occur when $\frac{dy}{dx} = 0$

$$0 = 3x^2 - 12$$

$$0 = 3(x^2 - 4)$$

$$0 = 3(x-2)(x+2)$$

$$x = 2 \text{ or } -2$$

when $x = 2$

$$y = 2^3 - 12 \times 2 + 4$$

$$= -12 \quad (2, -12)$$

when $x = -2$

$$y = (-2)^3 - 12(-2) + 4 \quad (-2, 20)$$

$$= 20$$

test whether each point is a max or min or p.o.i

for $x = 2$

if $x = 1$, $\frac{dy}{dx} = 3 \times 1^2 - 12 = -9 = \text{negative}$

if $x = 3$, $\frac{dy}{dx} = 3 \times 3^2 - 12 = 15 = \text{positive}$



the point $(2, -2)$ is a minimum

For $x = -2$

if $x = -3$, $\frac{dy}{dx} = 3 \times (-3)^2 - 12 = 15 = \text{positive}$

if $x = -1$, $\frac{dy}{dx} = 3 \times (-1)^2 - 12 = -15 = \text{negative}$



the point $(-2, 20)$ is a maximum.