



CHEMISTRY ONLINE
— TUITION —

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PURE MATH
ALGEBRA AND FUNCTION

Level & Board

EDEXCEL (A-LEVEL)

TOPIC:

QUADRATICS

PAPER TYPE:

SOLUTION 3

TOTAL QUESTIONS

8

TOTAL MARKS

40

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Q.1

Given

$$2qx^2 + qx - 1 = 0$$

For a quadratic equation,

$$ax^2 + bx + c = 0$$

The expression for solutions

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Where $b^2 - 4ac$ is called discriminant.

- (a) Since, given is a quadratic equation with no real roots, its discriminant must be:

$$b^2 - 4ac < 0$$

$$(q)^2 - 4(2q)(-1) < 0$$

$$q^2 + 8q < 0 \quad (\text{Hence Proved})$$

(b)

$$q^2 + 8q = 0$$

$$q(q + 8) = 0$$

$$q = 0 \quad \text{or} \quad q = -8$$

So, the critical points on curve for given condition are -8 and 0.

Therefore, conditions for

$$q^2 + 8q < 0 \quad \text{are:}$$

$$q > -8$$

$$q < 0$$

$$\Rightarrow -8 < q < 0$$

Q.2

Quadratic equation $ax^2 + bx + c = 0$ has two distinct roots when discriminant is positive,

$$\Rightarrow b^2 - 4ac > 0$$

$$kx^2 + k = 8x - 2xk$$

$$kx^2 + (2k - 8)x + k = 0$$

Note that when $k = 0$, then we get linear equation with just one root.

In this equation,

$$a = k, b = 2k - 8, c = k$$

$$\Rightarrow (2k - 8)^2 - 4(k)(k) > 0$$

$$4k^2 - 32k + 64 - 4k^2 > 0$$

$$\Rightarrow -32k > -64$$

$$k < 2, k \neq 0$$

Q.3

$$\text{Let } f(x) = x^3 + ax^2 + bx - 12$$

$$x - 2 = 0 \Rightarrow x = 2$$

$x - 2$ is a factor of $f(x)$

So, remainder = 0

$$\therefore (2)^3 + a(2)^2 + b(2) - 12 = 0$$

$$\Rightarrow 8 + 4a + 2b - 12 = 0$$

$$\Rightarrow 4a + 2b - 4 = 0$$

$$\Rightarrow 2a + b - 2 = 0 \rightarrow (1)$$

$$x + 3 = 0 \Rightarrow x = -3$$

$x + 3$ is a factor of $f(x)$

So, remainder = 0

$$\therefore (-3)^3 + a(-3)^2 + b(-3) - 12 = 0$$

$$\Rightarrow -27 + 9a - 3b - 12 = 0$$

$$\Rightarrow -27 + 9a - 3b - 12 = 0$$

$$\Rightarrow 9a - 3b - 39 = 0$$

$$\Rightarrow 3a - b - 13 = 0 \rightarrow (2)$$

Adding (1) and (2), we get

$$5a - 15 = 0$$

$$\Rightarrow a = 3$$

Putting the value of "a" in (1)

$$6 + b - 2 = 0$$

$$\Rightarrow b = -4$$

Q.4

The quadratic equation is given

$$x^2 - 4x - 1 = 2p(x-5)$$

$$x^2 - 4x - 1 = 2px - 10p$$

$$x^2 - 4x - 2px + 1 + 10p = 0$$

$$\Rightarrow x^2 + (-4 - 2p)x + (10p - 1) = 0$$

Here,

$$a = 1, b = -4 - 2p, c = 10p - 1$$

Two equal root

$$b^2 - 4ac = 0$$

$$(-4 - 2p)^2 - 4(1)(10p - 1) = 0$$

$$16 + 16p + 4p^2 - 40p + 4 = 0$$

$$4p^2 - 24p + 20 = 0$$

$$\Rightarrow p^2 - 6p + 5 = 0$$

Factorization

$$p^2 - 5p - p + 5 = 0$$

$$p(p - 5) - 1(p - 5) = 0$$

$$(p - 1)(p - 5) = 0$$

$$p - 1 = 0 \quad \text{or} \quad p - 5 = 0$$

$$p = 1 \quad \text{or} \quad p = 5$$

So,

$$p = 1, 5$$

Q.5

$$x^2 - 8x + 25$$

$$= (x - 4)^2 - (-4)^2 + 25$$

$$= (x - 4)^2 - 16 + 25$$

$$= (x - 4)^2 + 9$$

I am Sorry!!!!

Q.6

$$\begin{aligned}
 & -2x^2 + 12x + 2 \\
 & = -2(x^2 - 6x) + 2 \\
 & = -2((x - 3)^2 - 9) + 2 \\
 & = -2(x - 3)^2 + 18 + 2 \\
 & = -2(x - 3)^2 + 20
 \end{aligned}$$

Q.7

$$\begin{aligned}
 & 4 - 3x - x^2 \\
 & 4 - (x^2 + 3x)
 \end{aligned}$$

Complete the square coefficient of the x term: 3 divide it in half: $\frac{3}{2}$

Square it: $\left(\frac{3}{2}\right)^2$

Use $\left(\frac{3}{2}\right)^2$ to complete the square:

$$\begin{aligned}
 & = 4 + \left(\frac{3}{2}\right)^2 - \left(x^2 + 3x + \left(\frac{3}{2}\right)^2\right) \\
 & = \frac{25}{4} - \left(x + \frac{3}{2}\right)^2
 \end{aligned}$$

Q.8

$$\begin{aligned}
 & 8 + 2x - x^2 \\
 & = 8 - (x^2 - 2x) \\
 & = 8 - (x^2 - 2x + 1) \\
 & = 8 - (x - 1)^2 \\
 & = 8 - (1)(x - 1)^2 \\
 & = a - b(x + c)^2
 \end{aligned}$$

Where $b = 1$, $c = -1$

I am Sorry!!!!



A professional portrait of Dr. Ashar Rana, a man with dark hair and a beard, wearing glasses, a blue shirt, and a tie. He is seated at a desk in an office setting, with his hands clasped in front of him. Behind him is a large circular emblem with the words "EXCELLENCE IN EDUCATION". On the desk are two vases of flowers, a telephone, and some papers.

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