CHEMISTRY ONLINE
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PURE MATH

ALGEBRA AND FUNCTION

Level & Board	EDEXCEL (A-LEVEL)
TOPIC:	QUADRATICS
PAPER TYPE:	SOLUTION 2
TOTAL QUESTIONS	8
TOTAL MARKS	47

Quadratics 2 (solution)

Q.1

Given:

Roots are equal.

$\Rightarrow$ Di2scriminant = 0

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

Where a = 3, b = -k$\sqrt{3}$, c = 4

$\Rightarrow$ $\left(-k\sqrt{3}\right)^2$ -4(3)(4) = 0

$\Rightarrow$ $3k^2$ – 64 = 0

$\Rightarrow$ $3k^2$ = 64

$\Rightarrow$ $\frac{3k^2}{3} = \frac{64}{3}$

$\Rightarrow$ k^2 = 16

$\Rightarrow$ $k \pm 4$

So,

K = 4 , -4

Q.2

This equation is Based on the nature of roots.

Let

Equation is ax^2+ bx +c = 0 and the discriminant = b^2- 4ac

If Discriminant = 0

Then equation has real roots.

b^2- 4ac = 0

Here, a = k+3, b = 2(k+3), c=4

$\Rightarrow$ $[2(k+3)]^2$-4$[k+3]$ $[4]$ = 0

$\Rightarrow$ 4$(k+3)^2$-16$(k+3)$ = 0

Dividing by 4 on both side

$(k+3)^2$-4$(k+3)$ = 0

k^2+6k+9-4k-12 = 0

k^2+2k-3 = 0 $\because$ Factorize

k^2+ 3k – k – 3 = 0

$K(k+3) - 1(k+3) = 0$

$(k+3)(k-1) = 0$

$K = -3$, $k = 1$

But $k = -3$ not possible (Coefficient of $x^2 \pm 0$

So, value of $k = 1$.

Q.3

Given equation

$9x^2+6kx+4 = 0$

Since it has equal roots

Discriminant = 0

$\Rightarrow \quad b^2-4ac = 0$

Putting $a = 9$, $b = 6k$, $c = 4$

$\Rightarrow \quad (6k)^2-4(9)(4) = 0$

$\Rightarrow \quad 36k^2-144 = 0$

$\Rightarrow \quad 36k^2 = 144$

$\Rightarrow \quad k^2 = \frac{144}{36}$

$\Rightarrow \quad k^2 = \left(\frac{12}{6}\right)^2$

$\Rightarrow \quad k = \pm\left(\frac{12}{6}\right)$

OR

$K = \pm 2$

Thus, $k = 2$, -2

Q.4

(a) $f(x) = x^2 + 4kx + (3+11k)$

$\Rightarrow$ Add and subtract $4k^2$

$f(x) = x^2 + 4kx + 4k^2+3+11k-4k^2$

$f(x) = (x + 2k)^2+(3+11k-4k^2)$

Here,

$\{p = 2k , q = 3+11k-4k^2\}$

(b) $f(x) = 0$ has no real roots.

Thus,

Discriminant < 0

Thus $b^2 - 4ac < 0$

$(4k)^2 - 4(3+11k) < 0$

$16k^2 - 12 - 44k < 0$

Dividing by '4'

$4k^2 - 3 - 11k < 0$

$\Longrightarrow$ $4k^2 - 11k - 3 < 0$

So,

$4k^2 - 12k + k - 3 < 0$

$4k(k-3) + 1(k-3) < 0$

$(4k+1)(k-3) < 0$

$4k+1 < 0$, $k-3 < 0$

$4k < -1$, $k < 3$

$K < \frac{-1}{4}$,

$K < -0.25$,

So

$-0.25 < K < 3$

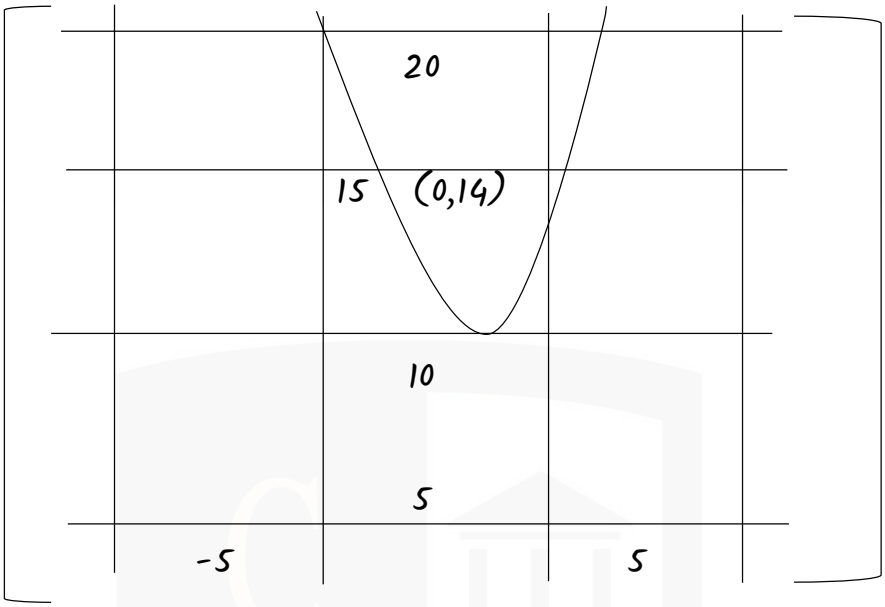
$S.S = \{k| -0.25 < k < 3\}$

(c) When $k = 1$

$F(x) = x^2 + 4x + 14$

The graph is as below

$Y = x^2 + 4x + 14$



Q.5 Given that 1 , r , r^2 are the roots of the equation

$x^3 + 2x^2 + 10x + k = 0$

Then the relation between the roots and coefficients are given by:

$1 + r + r^2 = -2 \quad \rightarrow \quad (1)$

$1.r + r.r^2 + r^2.1 = 10 \quad \rightarrow \quad (2)$

$1.r.r^2 = -k \quad \rightarrow \quad (3)$

From (1) , we have

$r + r^2 = -3$

from (2) , we have

$r + r^3 + r^2 = 10$

$r^3 - 3 = 10$

$r^3 = 10 + 3 = 13$

From (3) we have

$r^3 = -k \Rightarrow 13 = -k \Rightarrow k = -3$

Q.6 Here $a = 1$, $b = 3p$, $c = p$

$\because$ Discriminant $= 0$

$b^2 - 4ac = 0$

$(3p)^2 - 4(1)(p) = 0$

$9p^2 - 4p = 0$

$P(9p - 4) = 0$

$P = 0$ or $p = \frac{4}{9}$ Thus, $P = 0, \frac{4}{9}$

Q.7 It is given in the problem that the roots of the equation $x^2 - kx + 28 = 0$ are y and $y + 3$ $(k \pm 0)$

Let $\alpha = y$, $\beta = y + 3$

$|\alpha - \beta| = |y - y - 3| = 3$

$\because (\alpha + \beta)^2 = 9$

$\Rightarrow$ $(\alpha + \beta)^2 - 4\,\alpha\beta = 9$

$\because \alpha + \beta = k$

$\because$ $\alpha\beta = 28$

$\Rightarrow$ $(k)^2 - 4(28) = 9$

$k^2 - 112 = 9$

k^2 121

$\Rightarrow$ $K \pm 11$

So,

The k values are -11 or 11

Q.8 $kx^2 + 4x + (5-k) = 0$

(a) We know that the equation has 2 different real solution for x

So,

$D > 0$

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

So,,

$(4)^2 - 4(k)(5-k) > 0$

$16 - 20k + 4k^2 > 0$

$\Rightarrow \quad 4k^2 - 20k + 16 > 0$

$\Rightarrow \quad k^2 - 5k + 4 > 0$

So, it has proved

(b) $k^2 - 5k + 4 > 0$

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

$K(k-4) - 1(k-4) > 0$

$(k-1)(k-4) > 0$

So,

$K < 1$ or $k > 4$

- $\{The\ answer\ is\ k \in (-\infty, 1) u (4, +\infty)\}$

I am Sorry !!!!

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