11/6/2020

Ch-3

* Ex. 3.1

Q2 Find a quadratic polynomial, the sum and product of whose zeroes are the following number.

(i) $-3, 2$

Ans $x^2 - (\alpha + \beta)x + \alpha + \beta = 0$

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

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

(ii) $\sqrt{2}, \frac{1}{3}$

Ans $= x^2 - (\alpha + \beta)x + \alpha + \beta = 0$

$= x^2 - \sqrt{2}x + \frac{1}{3} = 0$

Multiply by 3

$3x^2 - 3\sqrt{2}x + 1 = 0$

(iii) $-\frac{1}{4}, \frac{1}{4}$

Ans $= \alpha + \beta = \frac{-b}{a} = \frac{-1}{4}$

$= \alpha \times \beta = \frac{c}{a} = \frac{1}{4}$

$= a = 4, b = 1, c = 1$

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

$= 4x^2 + x + 1 = 0$

(iv) $0, \sqrt{5}$.

Ans = $\alpha + \beta = \frac{-b}{a} = \frac{0}{1}$

$= \alpha + \beta = \frac{c}{a} = \frac{\sqrt{5}}{1}$

$= a = 1, b = 0, c = \sqrt{5}$

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

$= x^2 + \sqrt{5} = 0$

(v) $4, 1$

Ans = $x^2 - (\alpha + \beta)x + \alpha\beta = 0$

$= x^2 - 4x + 1 = 0$

(vi) $1, 1$.

Ans = $x^2 - (\alpha + \beta)x + \alpha\beta = 0$

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

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3 If the sum of squares of zeroes of quadratic Polynomial $f(x) = x^2 - 8x + k$ is 40, then find the value of k

Ans Given polynomial $f(x) = x^2 - 8x + k$

Let α and β are zeroes of polynomial $f(x)$ then.

Sum of zeroes $(\alpha + \beta) = -\frac{b}{a}$

$= \frac{-(-8)}{1} = 8$ ---- ①

And product of zeroes $(\alpha + \beta) = \frac{c}{a} = \frac{k}{1} = k$ ---- ②

A

Now, from eq. ①

$(\alpha + \beta) = 8$, Squaring both sides

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$\Rightarrow (\alpha + \beta)^2 = 8^2$

$\Rightarrow \alpha^2 + \beta^2 + 2\alpha\beta = 64$ --- (3)

It is given that sum of squares of ze[ros] is 40. That is, $\alpha^2 + \beta^2 = 40$

Putting values from eq. (1), (2) in (3)

$\Rightarrow 40 + 2K = 64$

$\Rightarrow 2K = 64 - 40$

$\Rightarrow 2K = 24$

$\Rightarrow K = 12$

$\therefore$ Thus ; $K = 12$ Ans

★ Exercise = 3.2.

Q1 Using division algorithm, divide $f(x)$ by $g(x)$ and find ~~qo~~ quotient and remainder

(i) $f(x) = 3x^4 + x^2 + 2x + 5$, $g(x) = 1 + 2x + x^2$

Ans

$x^2+2x+1 \,)\, 3x^3 + x^2 + 2x + 5 \,(\, 3x - 5$

$3x^3 + 6x^2 + 3x \downarrow$

$-\cancel{5x^2} - x + 5$

$-\cancel{5x^2} - 10x + 5$

$9x + 10$

(ii) $f(x) = x^3 - 3x^2 + 5x - 3$, $g(x) = x^2 - 2$

Ans

$x^2-2 \,)\, \cancel{x^3} - 3x^2 + 5x - 3 \,(\, x - 3$

$\cancel{x^3} \quad + 2x \downarrow$

$-3x^2 + 7x - 3$

$\cancel{-3x^2} \quad + 6$

$+7x - 9$

$Q: x-3$, $R = 7x - 9$

(iii) $f(x) = x^3 - 6x^2 + 11x - 6$, $g(x) = x + 2$

Ans

$x+2 \,)\, x^3 - 6x^2 + 11x - 6 \,(\, x^2 - 8x + 27$

$\cancel{-x^3} + -2x^2 \downarrow \downarrow$

$-8x^2 + 11x - 6$

$\cancel{-8x^2} + -16x$

$27x - 6$

$-27x + -54$

-60

$Q: x^2 - 8x + 27$,

$R = -60$.

(iv) $9x^4 - 4x^2 + 4$, $g(x) = 3x^2 + x - 1$

Ans

$$3x^2+x-1 \overline{)\,9x^4 - 4x^2 + 4\,}\,(3x^2 - x$$

$$-\underline{9x^4 \pm 3x^3 \mp 3x^2}$$

$$-3x^3 - x^2 + 4$$

$$-\underline{3x^3 - x^2 + x}$$

$$\underline{-x + 4}$$

Q: $3x^2 - x$, $R = -x + 4$.

Q2 Divide second Polynomial by first and verify that first Polynomial is a factor of ~~to~~ second Polynomial.

(i) $g(x) = x^2 + 3x + 1$, $f(x) = 3x^4 + 5x^3 - 7x^2 + 2x + 2$

Ans

$$\overline{)\,3x^4 + 5x^3 - 7x^2 + 2x + 2\,}\,(3x^2 - 4x + 2$$

$$\underline{3x^4 + 9x^3 + 3x^2}$$

$$-4x^3 - 10x^2 + 2x + 2$$

$$\underline{-4x^3 - 12x^2 - 4x}$$

$$2x^2 + 6x + 2$$

$$\underline{2x^2 + 6x + 2}$$

$$\underline{0}$$

Q: $3x^2 - 4x + 2$,
$R = 0$.

(ii) $g(x) = t^2 - 3$, $f(x) = 2t^4 + 3t^3 - 2t^2 - 9t - 12$.

Ans

$$t^2 - 3 \overline{)\,2t^4 + 3t^3 - 2t^2 - 9t - 12\,}\,(2t^2 + 3t + 4$$

$$\underline{2t^4 \qquad - 6t^2}$$

$$\begin{array}{r} 3t^3 + 4t^2 - 9t - 12 \\ \underline{3t^3 \qquad\quad - 9t \quad} \\ 4t^2 - 12 \\ \underline{4t^2 - 12} \\ 0 \end{array}$$

yes.

Q : $2t^2 + 3t + 4$,

R : 0.

(iii) $g(x) = x^3 - 3x + 1$, $f(x) = x^5 - 4x^3 + x^2 + 3x + 1$

Ans

$$x^3 - 3x + 1 \overline{\big) x^5 - 4x^3 + x^2 + 3x + 1 \big(} x^2 - 1$$

$$\begin{array}{r} \underline{x^5 - 3x^3 + x^2} \\ -x^3 + 3x + 1 \\ \underline{-x^3 + 3x - 1} \\ 2 \end{array}$$

No.

Q : $x^2 - 1$,

R : 2

Q3 In the following polynomial, their zeros are given, let find all other zeros

(i) $f(x) = 2x^4 - 3x^3 - 3x^2 + 6x - 2$; $\sqrt{2}$ and $-\sqrt{2}$

Ans $x = \sqrt{2}$, $x = -\sqrt{2}$

$(x - \sqrt{2})(x + \sqrt{2})$.

$(a - b)(a + b) = a^2 - b^2$

$= (x)^2 - (\sqrt{2})^2$

$= x^2 - 2$

$= x^2 - 2 \overline{\big) 2x^4 - 3x^3 - 3x^2 + 6x - 2 \big(} 2x^2 - 3x + 1$

$$\begin{array}{r} \underline{-2x^4 \qquad\qquad + 4x^2} \\ -3x^3 + x^2 + 6x - 2 \\ -3x^3 \qquad\quad + 6x \end{array}$$

$x^2 - x$

$\underline{x^2 - x}$

$\underline{0}$

$= 2x^2 - 3x + 1$

$= 2x^2 - 2x - 1x + 1$

$= 2x(x-1) - 1x + 1$

$= 2x(x-1) - 1(x-1)$

$= (x-1)(2x-1)$

$x = 1,\ 2x = 1,\ x = \frac{1}{2}$

3 $f(x) = x^4 - 6x^3 - 26x^2 + 138x - 35;\ 2 \pm \sqrt{3}$

Ans $x = 2 + \sqrt{3},\ x = 2 - \sqrt{3}$

$= (x - 2 - \sqrt{3}),\ (x - 2 + \sqrt{3})$

$= (a-b)(a+b) = a^2 - b^2$

$= (x+2)^2 - (\sqrt{3})^2$

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

$= x^2 - 4x + 4 - 3$

$= x^2 - 4x + 1$

$$
\begin{array}{r|l}
x^2 - 4x + 1 \;\big)\; x^4 - 6x^3 - 26x^2 + 138x - 35 & x^2 - 2x - 35 \\
\underline{-x^4 - 4x^3 + x^2} & \\
-2x^3 - 27x^2 + 138x - 35 & \\
\underline{\pm 2x^3 \pm 8x^2 \pm 2x} & \\
-35x^2 + 140x - 35 & \\
\underline{\pm 35x^2 \pm 140x \pm 35} & \\
0 &
\end{array}
$$

$= x^2 - 2x - 35$

$= x^2 - 7x + 5x - 35 = 0$

$= x(x-7) + 5(x-7) = 0$

$= (x-7)(x+5) = 0$

$= x = 7,\ x = -5$

3 $f(x) = x^3 + 13x^2 + 32x + 20;\ -2$

Ans = $x = -2$

$= (x+2)$

$$
\begin{array}{r|l}
x+2 & \cancel{x^3} + 13x^2 + 32x + 20 \quad (x^2 + 11x + 10 \\
 & \underline{\cancel{x^3} + 2x^2} \\
 & \cancel{11x^2} + 32x + 20 \\
 & \underline{-\cancel{11x^2} + 22x} \\
 & \cancel{10x} + 20 \\
 & \underline{\cancel{10x} + \cancel{20}} \\
 & \underline{0}
\end{array}
$$

$= x^2 + 11x + 10$

$= x^2 + 10x + 1x + 10$

$= x(x+10) + 1(x+10)$

$= (x+10)(x+1)$

$x = -10,\ x = -1$

Q4 On dividing polynomial $f(x) = x^3 - 3x^2 + x + 2$ by polynomial $g(x)$ quotient $q(x)$ and remainder $r(x)$ are obtained as $x - 2$ and $-2x + 4$ respiuely then find polynomial $g(x)$.

Ans = $f(x) = g(x) \times q(x) + (r(x))$

$= x^3 - 3x^2 + x + 2 = g(x)(x-2) + (-2x+4)$

$= x^3 - 3x^2 + 3x - 2 = g(x)(x-2)$

$= g(x) = \dfrac{x^3 - 3x^2 + 3x - 2}{x - 2}$

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$$x-2 \overline{\smash{\big)}\, x^3 - 3x^2 + 3x - 2} \quad \underline{x^2 - x + 1}$$

$$\underline{x^3 - 2x^2}$$

$$-x^2 + 3x - 2$$

$$+\ \underline{-x^2 \ -+\ 2x}$$

$$x - 2$$

$$\underline{x - 2}$$

$$\underline{0}$$

$$g(x) = x^2 - x + 1$$

* Exercise - 3.3.

Q1 check whether the following equation are quadr

(i) $x(x+1)+8=(x+2)(x-2)$.

Ans: $x^2+x+8 = x^2-2^2$

$= x+8 = -4$

$= x+8+4=0$

$= x+12=0$

$= bx+c=0$ No.

(ii) $(x+2)^3 = x^3-4$

Ans $=(x)^3+3(x)^2(2)+3x(2)^2+(2)^3 = x^3-4$

$= x^3+6x^2+12x+8 = x^3-4$

$= 6x^2+12x+8+4=0$

$= 6x^2+12x+12=0$

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

(iii) $x^2+3x+1=(x-2)^2$

Ans $x^2+3x+1=(x)^2-2(x)(2)+(2)^2$

$= x^2+3x+1 = x^2-4x+4$

$= 3x+4x+1-4=0$

$= 3x+4x+1-4=0$

$= 7x-3=0$ No.

(iv) $x+\frac{1}{x}+x^2$

Ans x^2+1+x^3 No.

$ax^2 + bx + c = 0$

Root =
Real, Dis.

$D = b^2 - 4ac$

Real

$D > 0$
Positive

Perfect Sq. No. (1, 4, 9, 16, 25, 1)

Other No. (2, 3, 5, 6 ...)

→ Prime factor
→ Perfect
→ Shree Dh. Formula

→ Perfect Sq. Method
→ Formula Method.

$D = 0$ Equal Root
→ Perfect Sq.
→ Prime fac.
→ Formula

$D < 0$
Negative

Q:1 Prime Factorisation method.

(i) $2x^2 - 5x + 3 = 0$

Ans = $2x^2 - 2x - 3x + 3 = 0$

$= 2x(x-1) - 3(x-1) = 0$

$= (x-1)(2x-3) = 0$

$= x = 1, \quad 2x = 3$

$x = \frac{3}{2}$

(ii) $9x^2 - 3x - 2 = 0$

Ans. $9x^2 - 6x + 3x - 2 = 0$

$3x(3x-2) + 1(3x-2) = 0$

$(3x-2)(3x+1) = 0$

$3x = 2, \quad 3x = -1$

$x = \frac{2}{3}, \quad x = \frac{-1}{3}$

(iii) $\sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$

Ans = $\sqrt{3}x^2 + 3x + 7x + 7\sqrt{3} = 0$

= $\sqrt{3}x(x + \sqrt{3}) + 7(x + \sqrt{3}) = 0$

= $(x + \sqrt{3})(\sqrt{3} + 7) = 0$

= $x = -\sqrt{3}$, $\sqrt{3}x = -7$

$x = \frac{-7}{\sqrt{3}}$

(iv) $x^2 - 8x + 16 = 0$

Ans = $x^2 - 4x - 4x + 16 = 0$

= $x(x - 4) - 4(x - 4) = 0$

= $(x - 4)(x - 4) = 0$

= $x = 4$, $x = 4$

Q2 Solve the following equations by factorisation method:

(i) $\frac{1}{x-2} + \frac{2}{x-1} = \frac{6}{x}$ $x \neq 1, 2$

Ans = $\frac{x - 1 + 2x - 4}{(x-2)(x-1)} = \frac{6}{x}$

= $\frac{3x - 5}{x^2 - 3x + 2} = \frac{6}{x}$

= $3x^2 - 5x = 6x^2 - 18x + 12$

= $6x^2 - 18x + 12 - 3x^2 + 5x = 0$

= $3x^2 - 13x + 12 = 0$

= $3x^2 - 9x - 4x + 12 = 0$

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

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

$x = 3$, $3x - 4 = 0$

$3x = 4$

$x = \frac{4}{3}.$

(vi) $100x^2 - 20x + 1 = 0$

Ans = $100x^2 - 10x - 10x + 1 = 0$

= $10x(10x - 1) - 1(10x - 1) = 0$

= $(10x - 1)(10x - 1) = 0$

= $10x = 1$, $10x = 1$

= $x = \frac{1}{10}$, $x = \frac{1}{10}$

(vii) $3x^2 - 2\sqrt{6}x + 2 = 0$

Ans = $3x^2 - \sqrt{6}x - \sqrt{6}x + 2 = 0$

= $\sqrt{3}x(\sqrt{3}x - \sqrt{2}) - \sqrt{2}(\sqrt{3}x - \sqrt{2})$

= $(\sqrt{3}x - \sqrt{2})(\sqrt{3}x - \sqrt{2})$

= $\sqrt{3}x = \sqrt{2}$

$x = \frac{\sqrt{2}}{\sqrt{3}}$

(viii) $x^2 + 8x + 7 = 0$

Ans = $x^2 + 7x + 1x + 7 = 0$

= $x(x + 7) + 1(x + 7) = 0$

= $(x + 7)(x + 1) = 0$

= $x = -7$, $x = -1$

(ix) $\frac{x + 3}{x + 2} = \frac{3x - 7}{2x - 3}$

Ans = $(x + 3)(2x - 3) = (x + 2)(3x - 7)$

= $7x^2 - 3x \cancel{+6x} + 9 = 3x^2 - 7x \cancel{+6x} + 14$

$= 3x^2 - 7x - 14 - 2x^2 + 3x + 9 = 0$

$= x^2 - 4x - 5 = 0$

$= x^2 - 5x + 1x - 5 = 0$

$= x(x-5) + 1(x-5) = 0$

$= (x-5)(x+1) = 0$

$= x = 5 , x = -1$

(X) $4x^2 - 4a^2 x + a^4 - b^4 = 0$

Ans $= 4x^2 - 4a^2 x + [(a^2)^2 - (b^2)^2] = 0$

$= 4x^2 - 4a^2 x + (a^2+b^2)(a^2-b^2) = 0$

$= 4x^2 - 2x(a^2+b^2) - 2x(a^2-b^2) + (a^2+b^2)(a^2-b^2)$

$= 2x(2x - (a^2+b^2)) - (a^2-b^2)[2x - (a^2+b^2)] = 0$

$= [2x - (a^2+b^2)][2x - (a^2-b^2)] = 0$

$= 2x = a^2 + b^2$

$= x = \frac{a^2+b^2}{2}$

(xi) $abx^2 + (b^2 - ac)x - bc = 0$

Ans $= abx^2 + b^2 x - acx - bc = 0$

$= bx(ax+b) - c(ax+b) = 0$

$= (ax+b)(bx-c) = 0$

$= ax = -b , bx = c$

$x = -\frac{b}{a} \quad x = \frac{c}{b}$

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★ Exercise → 3.4

1) Solve the following quadratic equations by the method of perfect square

(i) $3x^2 - 5x + 2 = 0$

Ans $3x^2 - 5x = -2$

Divide by 3 :-

$$x^2 - \frac{5}{3}x = -\frac{2}{3}$$

Coff. of $x = \frac{5}{3}$, half of $\frac{5}{3} \times \frac{1}{2} = \frac{5}{6}$

Square $= \left(\frac{5}{6}\right)^2 = \frac{25}{36}$ Add both side

$$x^2 - \frac{5}{3}x + \frac{25}{36} = -\frac{2}{3} + \frac{25}{36}$$

$$a^2 - 2ab + b^2 = (a-b)^2$$

$$(x)^2 - 2x\left(\frac{5}{6}\right) + \left(\frac{5}{6}\right)^2 = \frac{-24 + 25}{36}$$

$$\left(x - \frac{5}{6}\right)^2 = \frac{1}{36}$$

$$x - \frac{5}{6} = \pm\sqrt{\frac{1}{36}} = \pm\frac{1}{6}$$

$$x = \frac{5}{6} \pm \frac{1}{6}$$

$$x = \frac{5 \pm 1}{6}$$

$x = \frac{6}{6}$	$x = \frac{4}{6}$
$x = 1$	$x = \frac{2}{3}$

(ii) $5x^2 - 6x - 2 = 0$

Ans $5x^2 - 6x = 2$

Divide by 5 :

$$x^2 - \frac{6}{5}x = \frac{2}{5}$$

~~Coff~~. Adding Both Side $\left(\frac{\cancel{6}^{3}}{5} \times \frac{1}{\cancel{2}}\right)^2 = \left(\frac{3}{5}\right)^2 = \frac{9}{25}$

$$x^2 - \frac{6}{5}x + \frac{9}{25} = \frac{2}{5} + \frac{9}{25}$$

$$(x)^2 - 2 \times x \times \frac{3}{5} + \left(\frac{3}{5}\right)^2 = \frac{10+9}{25}$$

$$\left(x - \frac{3}{5}\right)^2 = \frac{19}{25}$$

$$x - \frac{3}{5} = \pm\sqrt{\frac{19}{25}} = \pm\frac{\sqrt{19}}{5}$$

$$x = \frac{3}{5} \pm \frac{\sqrt{19}}{5}$$

$$x = \frac{3 \pm \sqrt{19}}{5}$$

$x = \frac{3+\sqrt{19}}{5}$	$x = \frac{3-\sqrt{19}}{5}$

(iii) $4x^2 + 3x + 5 = 0$

Ans $[4x^2 + 3x = -5$

$x^2 + \frac{3}{4}x = -\frac{5}{4}]$

$$4x^2 + 3x = -5$$

$$x^2 + \frac{3}{4}x = -\frac{5}{4}$$

Adding Both side $\left(\frac{3}{4} \times \frac{1}{2}\right)^2 = \left(\frac{3}{8}\right)^2 = \frac{9}{64}$

$$x^2 + \frac{3}{4}x + \frac{9}{64} = -\frac{5}{4} + \frac{9}{64}$$

$$\left(x + \frac{3}{8}\right)^2 = -\frac{80+9}{64}$$

$$\left(x + \frac{3}{8}\right)^2 = -\frac{71}{64}$$

$$x + \frac{3}{8} = \sqrt{\frac{-71}{64}}$$

Imaginary.

(iv) $4x^2 + 4\sqrt{3}x + 3 = 0$

Ans $4x^2 + 4\sqrt{3}x = -3$

$$x^2 + \sqrt{3}x = -\frac{3}{4}$$

Add Both side $\left(\sqrt{3} \times \frac{1}{2}\right)^2 = \left(\frac{\sqrt{3}}{2}\right)^2 = \frac{3}{4}$

$$x^2 + \sqrt{3}x + \frac{3}{4} = -\frac{3}{\cancel{4}} + \frac{3}{\cancel{4}} \cdot 0$$

$$\left(x - \frac{\sqrt{3}}{2}\right)^2 = 0$$

$$x - \frac{\sqrt{3}}{2} = \pm\sqrt{0} = \pm 0$$

$$x = \frac{\sqrt{3}}{2} \pm 0$$

$x = \frac{\sqrt{3}}{2}$	$x = \frac{\sqrt{3}}{2}$

(v) $2x^2 + x - 4 = 0$

Ans $2x^2 + x = 4$

Add Both side $\left(\frac{1}{2} \times \frac{1}{2}\right)^2 = \left(\frac{1}{4}\right)^2 = \frac{1}{16}$

$$x^2 + \frac{x}{2} + \frac{1}{16} = 2 + \frac{1}{16}$$

$$\left(x + \frac{1}{4}\right)^2 = \frac{32+1}{16} = \frac{33}{16}$$

$$x + \frac{1}{4} = \pm\sqrt{\frac{33}{16}} = \pm\frac{\sqrt{33}}{4}$$

$$x = -\frac{1}{4} \pm \frac{\sqrt{33}}{4}$$

$$x = \frac{-1 \pm \sqrt{33}}{4}$$

(vi) $2x^2 + x + 4 = 0 = 2x^2 + x = -4$

Ans $x^2 + \frac{x}{2} = -2$

Add both side $\left(\frac{1}{2} \times \frac{1}{2}\right)^2 = \left(\frac{1}{4}\right)^2 = \frac{1}{16}$

$$x^2 + \frac{x}{2} + \frac{1}{16} = -2 + \frac{1}{16}$$

$$\left(x + \frac{1}{4}\right)^2 = \frac{-32+1}{16} = -\frac{31}{16}$$

$$x + \frac{1}{4} = \pm\sqrt{\frac{-31}{16}}$$

Imaginary

(vii) $4x^2 + 4bx - (a^2 - b^2) = 0$

$$4x^2 + 4bx = (a^2 - b^2)$$

$$x^2 + bx = \frac{a^2 - b^2}{4}$$

Adding Both sides $\left(b + \frac{1}{2}\right)^2 = \left(\frac{b}{2}\right)^2 = \frac{b^2}{4}$

$$x^2 + bx + \frac{b^2}{4} = \frac{a^2 - b^2}{4} + \frac{b^2}{4}$$

$$\left(x + \frac{b}{2}\right)^2 = \frac{a^2 - b^2 + b^2}{4} = \frac{a^2}{4}$$

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

$$x = \frac{-b}{2} \pm \frac{a}{2}$$

$$x = \frac{-b \pm a}{2}$$

$$x = \frac{a - b}{2} \quad \frac{-b + a}{2}$$

$$\left(x = \frac{-b - a}{2}\right)$$

Q2 Find the roots of the following quadratic equations, if they exist, using the quadratic formula of Shridhar Acharya.

(i) $2x^2 - 2\sqrt{2}x + 1 = 0$

Ans $a = 2,\ b = 2\sqrt{2},\ c = 1$

$D = b^2 - 4ac$

$= (2\sqrt{2})^2 - 4 \times 2 \times 1$

$= 8 - 8 = 0$

Real & equal

$$x = \frac{-b}{2a},\ \frac{-b}{2a} = x$$

$$x = \frac{-(2\sqrt{2})}{2 \times 2}$$

$$x = \frac{2\sqrt{2}}{4}$$

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

(ii) $9x^2 + 7x - 2 = 0$

Ans $a = 9,\ b = 7,\ c = -2$

$$D = b^2 - 4ac$$
$$= 7^2 - 4 \times 9 \times (-2)$$
$$= 49 + 72$$
$$D = 121$$
$$x = \frac{-b \pm \sqrt{D}}{2a}$$
$$x = \frac{-7 \pm \sqrt{121}}{2 \times 9}$$
$$x = \frac{-7 \pm 11}{18}$$

$x = \frac{-7+11}{18}$	$x = \frac{-7-11}{18}$
$x = \frac{4}{18} = \frac{2}{9}$	$x = \frac{-18}{18} = -1$

(iii) $x + \frac{1}{x} = 3,\ x \neq 0$

Ans $x^2 + 1 = 3x$

$$x^2 - 3x + 1 = 0$$
$$a = 1,\ b = -3,\ c = 1$$
$$D = b^2 - 4ac$$
$$= (-3)^2 - 4 \times 1 \times 1$$
$$= 9 - 4 = 5$$
$$x = \frac{-b \pm \sqrt{D}}{2a}$$

(vi) $\frac{1}{x} - \frac{1}{x-2} = 3, x \neq 0, 2$

Ans $\frac{\cancel{x} - 2 - \cancel{x}}{x(x-2)} = 3$

$\frac{-2}{x^2 - 2x} = \frac{3}{1}$

$3x^2 - 6x = -2$

$3x^2 - 6x + 2 = 0$

$a = 3, b = -6, c = -2$

$D = b^2 - 4ac$

$D = (-6)^2 - 4 \times 3(+2)$

$= 36 - 24 = 12$

$x = \frac{-b \pm \sqrt{D}}{2a}$

$x = \frac{-(-6) \pm \sqrt{12}}{2 \times 3}$

$x = \frac{6 \pm 2\sqrt{3}}{6}$

$x = \frac{\cancel{2}(3 \pm \sqrt{3})}{\cancel{6}\,3}$

$x = \frac{3 \pm \sqrt{3}}{3}$

5) Divid 16 Find two - - - - - - is 290

Ans Let 1st No. $= x$

2nd No. $= x + 2$

According to quetion -

$(x^2) + (x+2)^2 = 290$

$x^2 + x^2 + 2 \times x \times 2 + 2^2 = 290$

$2x^2 + 4x + 4 - 290 = 0$

$2x^2 + 4x - 286 = 0$

$x^2 + 2x - 143 = 0$

$a = 1,\ b = 2,\ c = -143$

$D = b^2 - 4ac$

$= 2^2 - 4 \times 1 \times (-143)$

$= 4 + 572 = 576$

$x = \frac{-b \pm \sqrt{D}}{2a}$

$= \frac{-2 \pm \sqrt{576}}{2 \times 1}$

$x = \frac{-2 \pm 24}{2}$

$x = \frac{-2+24}{2}$	$x = \frac{-2-24}{2}$
1st $x = \frac{22}{2} = 11$	$x = -\frac{26}{2} = -13$ ×
2nd $11 + 2 = 13$	

4 The difference - - - - - - numbers

Ans Let large No. $= x$

small No. $= y$

~~I~~ 6 I time

$x^2 - y^2 = 45$ — ①

II

$y^2 = 4x$ — ②

$x^2 - 4x - 45 = 0$

$a = 1,\ b = -4,\ c = -45$

$D = b^2 - 4ac$

$= (-4)^2 - 4 \times 1 \times (-45) = 16 + 180 = 196$

$x = \frac{-b \pm \sqrt{D}}{2a}$

$= \frac{-(-4) \pm \sqrt{196}}{2 \times 1}$

$$x = \frac{4 \pm 14}{2}$$

$x = \frac{4+14}{2}$	$x = \frac{4-14}{2}$
$x = \frac{18}{2} = 9$	$x = \frac{-10}{2} = -5$ ×
$y^2 = 4(9) = 36$	
$y = \sqrt{36} = 6$	

Q
3 Divide 16 - - - - - - - - smaller Part

Ans let be large No. $= x$

Small No $= 16 - x$

Acc. to ques. $\cancel{(-x)^2} =$

$$\cancel{(-x)^2} = 2x^2 = (16-x)^2 + 164$$

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

$$2x^2 = 256 - 32x + x^2 + 164$$

$$2x^2 - x^2 + 32x - 420 = 0$$

$$x^2 + 32x - 420 = 0$$

$$x^2 + 42x - 10x - 10x - 420$$

* $$x(x+42) - 10(x+42) = 0$$

$$(x+42)(x-10) = 0$$

$x = -42$ ×	$x = 10$
	2
	$= 16 - 10$
	$= 6$

★ Exercise - 3.5.

Q.1 Find the name - - - - - - - equations

(i) $2x^2 - 3x + 5 = 0$

Ans $a = 2,\ b = -3,\ c = 5$

$D = b^2 - 4ac$

$= (-3)^2 - 4 \times 2 \times 5$

$= 9 - 40$

$D = -31$

Imaginary Root

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

Ans $a = 2,\ b = -4,\ c = 3$

$D = b^2 - 4ac$

$= (-4)^2 - 4 \times 2 \times 3$

$= 16 - 24$

$= -8$

Imaginary Root

(iii) $2x^2 + x - 1 = 0$

Ans $a = 2,\ b = 1,\ c = -1$

$D = b^2 - 4ac$

$= 1^2 - 4 \times 2 \times (-1)$

$= 1 + 8$

$= 9$

Real & Dis. Root.

(iv) $x^2 - 4x + 4 = 0$

Ans $a = 1$, $b = -4$, $c = 4$

$D = b^2 - 4ac$

$= (-4)^2 - 4 \times 1 \times 4$

$= 16 - 16$

$= 0$

Real & Equal Root

(v) $2x^2 + 5x + 5 = 0$

Ans $a = 2$, $b = 5$, $c = 5$

$D = b^2 - 4ac$

$= 5^2 - 4 \times 2 \times 5$

$= 25 - 40$

$D = -15$

Imaginary Root

(vi) $3x^2 - 2x + \frac{1}{3} = 0$

A

Ans $a = 3$, $b = -2$, $c = \frac{1}{3}$

$D = b^2 - 4ac$

$= (-2)^2 - 4 \times \cancel{3} \times \frac{1}{\cancel{3}}$

$= 4 - 4$

$= 0$

Real & Equal Root

Q2 Find the - - - - - - - - - real and equal

(i) $kx(x-2)+6=0$

Ans $kx^2-2kx+6=0$

$a=k,\ b=-2k,\ c=6$

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

$=(-2k)^2-4\times k\times 6=0$

$=4k^2-24k=0$

$4k(k-6)=0$

$4k=0$	$x-6=0$
$k=\frac{0}{4}=0$	$k=6.$

(ii) $x^2-2(k+1)x+k^2=0$

Ans $a=1,\ b=-2(k+1),\ c=k^2$

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

$=[-2(k+1)]^2-4\times 1\times k^2=0$

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

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

$4k^2+8k+4-4k^2=0$

$8k=-4$

$k=-\frac{4}{8}=-\frac{1}{2}$

(iii) $2x^2+kx+3=0$

Ans $a=2,\ b=k,\ c=3$

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

$k^2-4\times 2\times 3=0$

$k^2-24=0$

$k^2=24$

$k = \pm\sqrt{24}, \pm\sqrt{6\times4}$

$k = \pm 2\sqrt{6}$

$k = \pm 2\sqrt{6}, k = -2\sqrt{6}$

(iv) $(k+1)x^2 - 2(k-1)x + 1 = 0$

Ans $a = k, b = -5, c = k$

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

$= (-5)^2 - 4\times k\times k = 0$

$= 25 - 4k^2 = 0$

$+4k = +25$

$k^2 = \frac{25}{4}$

$k = \pm\sqrt{\frac{25}{4}} = \pm\frac{5}{2}$

$k = \frac{5}{2}, k = -\frac{5}{2}$

Q4 Find the - - - - - - - - distinct roots

(i) $kx^2 + 2x + 1 = 0$

Ans. $D = b^2 - 4a\cancel{b}c > 0$

$a = k, b = 2, c = 1$

$2^2 - 4\times k\times 1 > 0$

$4 - 4k > 0$

$4 > 4k$

$\frac{4}{4} > 4k$

$1 > 4k$

(ii) $kx^2 + 6x + 1$

Ans $a = k, b = 6, c = 1$

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

$b^2 - 4 \times k \times 1 > 0$

$36 - 4k > 0$

$-4k > -36$

$4k < 36$

$k < \frac{36}{4} = 9$

(iii) $x^2 - kx + 9 = 0$

Ans $a = 1,\ b = -k,\ c = 9$

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

$= (-k)^2 - 4 \times 1 \times 9 > 0$

$k^2 - 36 > 0$

$k^2 = 36$

$k = \pm\sqrt{36} = \pm 6$

$k > \pm 6$

$k > 6$

$k < -6$

Q3 Find the - - - - - - - - - roots

Ans $x^2 + 5kx + 16 = 0$

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

$a = 1;\ b = 5k,\ c = 16$

$(5k)^2 - 4 \times 1 \times 16 < 0$

$25k^2 - 64 < 0$

$25k^2 < 64$

$k^2 < \frac{64}{25}$

$k < \pm\sqrt{\frac{64}{25}}$

$k < \pm \frac{8}{5}$

$k < \frac{8}{5}$

$k > -\frac{8}{5}$

Q5 If roots - - - - - - - - - - a+c

Ans Prove that $= 2b = a+c$

$(a = b-c), b = c-a, c = (a-b)$

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

$(c-a)^2 - 4(b-c)(a-b) = 0$

$= c^2 - \cancel{2b}\, 2ac + a^2 - 4(ab - b^2 - ac + bc) = 0$

$= c^2 - 2ac + a^2 - 4ab + b^2 + 4ac - 4bc = 0$

$= \underline{c^2 + 2ac + a^2} - \underline{4bc - 4ab} + \underline{4b^2} = 0$

$= (c-a)^2 - 4b \quad (c+a) \quad + \quad 4b^2 = 0$

$= (c+a)^2 - 2(c+a)\,2b + (2b)^2 = 0$

$((c+a) - 2b)^2 = 0$

$= \underline{a^2 + 2ab + b^2}$

$(a+b)^2$

$= c + a - 2b = \sqrt{0} = 0$

$= c + a = 2b$

$= 2b = a + c$

★ Exercise - 3.6

Q. Find the LCM & H.C.F

(i) $24x^2yz$ and $27x^4y^2z^2$

Ans $24x^2yz = 2^3 \times 3 \times x^2 \times y \times z$

$27x^4y^2z^2 = 3^3 \times x^4 \times y^2 \times z^2$

HCF $= 3 \times x^2 \times y \times z$

$= 3x^2yz$

LCM $= 2^3 \times 3^3 \times x^4 \times y^2 \times z^2$

$= 216\, x^4y^2z^2$

(ii) $x^2 - 3x + 2 = (x-2)(x-1)$

$x^4 + x^3 - 6x^2 = x^2(x+3)(x-2)$

LCM →

$x^2 - 3x + 2$	
$x^2 - 2x - 1x + 2$	
$x(x-2) - 1(x-2)$	
$(x-2)(x-1)$	

~~HCF~~ → HCF $= (x-2)$

LCM $= x^2 (x-1)(x-2)(x+3)$

(iii) $2x^2 - 8$ and $x^2 - 5x + 6$

Ans $2x^2 - 8 = 2(x+2)(x-2)$

$x^2 - 5x + 6 =$

HCF $= (x-2)$

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

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

$2x^2 - 8$	
$2(x^2-4)$	
$2(x^2-2^2)$	
$2(x+2)(x-2)$	

(iv) $x^2 - 1$; $(x^2+1)(x+1)$ and x^2+x-1

Ans $x^2 - 1 = (x+1)(x-1)$

$(x^2+1)(x+1) = (x^2+1)(x+1)$

$x^2+x-1 = (x^2+x-1)$

HCF $= 1$

LCM $= (x+1)(x-1)(x^2+1)(x^2+x-1)$

$= (x^2-1)(x^2+1)(x^2+x-1)$

$= (x^4-1)(x^2+x-1)$

(v) $18(6x^4+x^3-x^2)$ and $45(2x^6+3x^5+x^4)$

Ans $18(6x^4+x^3-x^2) = 2\times3^2x^2(2x+1)(3x-1)$

$45(2x^6+3x^5+x^4) = 5\times3^2x^4(x+1)(2x+1)$

$6x^2+x-1$	$(2x^2+3x+1)$
$6x^2+3x-2x-1$	$2x^2+2x+1x+1$
$3x(2x+1)-1(2x+1)$	$2x(x+1)+1(x+1)$
$(2x+1)(3x-1)$	$(x+1)(2x+1)$

HCF $= 3^2x^2(2x+1)$

$= 9x^2(2x+1)$

LCM $= 2\times5\times3^2\times x^4$

$(2x+1)(x+1)(3x-1)$

$= 90x^4(x+1)(3x-1)(2x+1)$

Q2 Find the HCF - - - - - expressions.

(i) a^3b^4, ab^5, a^2b^8

Ans. HCF $= ab^4$

LCM $= a^3b^8$

(ii) $16x^2y^2$, $48x^4z$

Ans $16x^2y^2 = 2^4\times x^2\times y^2$

$48x^4z = 2^4 \times 3 \times x^4 \times z$

HCF $= 2^4 \times x^2 = 16x^2$

LCM $= 2^4 \times 3 \times x^4 \times y^2 \times z$

$= 48x^4y^2z$

(iii) $x^2 - 7x + 12$; $x^2 - 10x + 21$ and $x^2 + 2x - 15$

Ans $x^2 - 7x + 12 = (x-4)(x-3)$

$x^2 - 10x + 21 = (x-3)(x-7)$

$x^2 + 2x - 15 = (x+5)(x-3)$

HCF $= (x-3)$

LCM $= (x-3)(x-4)(x+5)(x-7)$

(iv) ~~(x)~~ $(x+3)^2(x+2)$ and $(x+3)(x-2)^2$

Ans HCF $= (x+3)(x-2)$

LCM $= (x+3)^2(x-2)^2$

(v) $24(6x^4 - x^3 - 2x^2)$ and $120(6x^6 + 3x^5 + x^4)$

Ans $24(6x^4 - x^3 - 2x^2) = \cancel{24}\, 2^3 \times 3x^2(3x-2)(2x+1)$

$120(6x^6 + 3x^5 + x^4) = 2^2 \times 5x^4(2x+1)(3x+1)$

$6x^2 - x - 2$	$6x^2 + 5x + 1$
$6x^2 - 4x + 3x - 2$	$6x^2 + 3x + 2x + 1$
$2x(3x-2) + 1(3x-2)$	$3x(2x+1) + 1(2x+1)$
$(3x-2)(2x+1)$	$(2x+1)(3x+1)$

HCF $= 2^2x^2(2x+1)$

$= 4x^2(2x+1)$

LCM $= 2^3 \times 3(3x-2)5x^4$

$(2x+1)(3x+1)$

$= 120x^4(3x-2)(2x+1)(3x+1)$

Q.4 If - - - - - - - - - - $\times v(x)$.

Ans. $u(x)$ If $u(x) = (x-1)^2$; $v(x) = (x^2-1)$

$u(x) = (x-1)^2$

$v(x) = (x^2-1) = (x+1)(x-1)$

$HCF = (x-1)$

$LCM = (x+1)(x-1)^2$

verify

$LCM \times HCF = u(x) \times v(x)$

$(x+1)(x-1)^2 \times (x-1) = (x-1)^2 (x^2-1)$

$(x-1)^2 (x^2-1) = (x-1)^2 (x^2-1)$

Q.3 The Product - - - - - - (LCM)

Ans. $(x-7)(x^2+8x+12)$

$HCF = (x+6)$

$LCM = ?$

$HCF \times LCM =$ Pro. of Two exp.

$(x+6) \times LCM = (x-7)(x^2+8x+12)$

$$LCM = \frac{(x-7)(x+2)(x+6)}{(x+6)}$$

$LCM = (x-7)(x+2)$

$= x^2 - 5x - 14$

Q.5 If HCF - - - - expressions

Ans. $HCF \times LCM = u(x) \times v(x)$

$(x-5)(x^3 - 19x - 30) = u(x) \times v(x)$

$(x-5)\ [(x-5)(x^2+5x+6)] = u(x) \times v(x)$

$(x-5)\ [(x-5)(x+2)(x+3)] = u(x) \times v(x)$

$x-5 \overline{)\ x^3 - 19x - 30}\ (x^2+5x+6$

$-\cancel{x^3} \mp 5x^2$

$5x^2 - 19x$

$-5x^2 \mp 25x$

$\cancel{6x - 30}$

$\cancel{63 - 30}$

HCF

Common fac.

I. $(x-5)(x+2) = x^2 - 3x - 10$

II. $(x-5)(x+3)$

$= x^2 - 2x - 15$