VIDYA BHAWAN BALIKA VIDYA PITH

शक्तिउत्थानआश्रमलखीसरायबिहार

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4. Factorize:

(i) $12x^2-7x+1$

Solution:

Using the splitting the middle term method,

We have to find a number whose sum = -7 and product =1×12 = 12

We get -3 and -4 as the numbers [-3+-4=-7 and -3×-4 = 12]

$12x^2-7x+1= 12x^2-4x-3x+1$

$= 4x(3x-1)-1(3x-1)$

$= (4x-1)(3x-1)$

(ii) $2x^2+7x+3$

Solution:

Using the splitting the middle term method,

We have to find a number whose sum = 7 and product = 2×3 = 6

We get 6 and 1 as the numbers [6+1 = 7 and 6×1 = 6]

$2x^2+7x+3 = 2x^2+6x+1x+3$

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

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

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

Solution:

Using the splitting the middle term method,

We have to find a number whose sum = 5 and product = 6×-6 = -36

We get -4 and 9 as the numbers [-4+9 = 5 and -4×9 = -36]

$6x^2+5x-6 = 6x^2+9x-4x-6$

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

= (2x+3)(3x−2)

(iv) 3x²−x−4

Solution:

Using the splitting the middle term method,

We have to find a number whose sum = -1 and product = 3×-4 = -12

We get -4 and 3 as the numbers [-4+3 = -1 and -4×3 = -12]

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

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

$= x(3x-4)+1(3x-4)$

$= (3x-4)(x+1)$

5. Factorize:

(i) x³−2x²−x+2

Solution:

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

Factors of 2 are ±1 and ± 2

Now,

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

$p(-1) = (-1)^3-2(-1)^2-(-1)+2$

$= -1-2+1+2$

$= 0$

Therefore, (x+1) is the factor of p(x)

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

$$x+1 \enclose{longdiv}{x^3 - 2x^2 - x + 2}$$

$$x^3 + x^2$$

$$-\quad-$$

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

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

$$+\quad+$$

$$2x + 2$$

$$2x + 2$$

$$-\quad-$$

$$0$$

Now, Dividend = Divisor × Quotient + Remainder

(x+1)(x²−3x+2) = (x+1)(x²−x−2x+2)

= (x+1)(x(x−1)−2(x−1))

= (x+1)(x−1)(x-2)

(ii) x³−3x²−9x−5

Solution:

Let p(x) = x³−3x²−9x−5

Factors of 5 are ±1 and ±5

By trial method, we find that

p(5) = 0

So, (x-5) is factor of p(x)

Now,

p(x) = x³−3x²−9x−5

p(5) = (5)³−3(5)²−9(5)−5

= 125−75−45−5

= 0

Therefore, (x-5) is the factor of p(x)

$$\begin{array}{r}
x^2 + 2x + 1 \\
\hline
x^3 - 3x^2 - 9x - 5 \\
x^3 - 5x^2 \\
\underline{-+} \\
2x^2 - 9x - 5 \\
2x^2 - 10x \\
\underline{-+} \\
x - 5 \\
x - 5 \\
\underline{-+} \\
0
\end{array}$$

with divisor $x - 5$.

Now, Dividend = Divisor × Quotient + Remainder

$(x-5)(x^2+2x+1) = (x-5)(x^2+x+x+1)$

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

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