RD SHARMA

Solutions

Class 9 Maths

Chapter 6

Ex *6.2*

Q1. If $f(x) = 2x^3 - 13x^2 + 17x + 12$, Find

1. **f(2)**
2. **f(-3)**
3. **f(0)**

Sol :

The given polynomial is $f(x) = 2x^3 - 13x^2 + 17x + 12$

1. f(2)

we need to substitute the ‘ 2 ‘ in f(x)

$$f(2) = 2(2)^3 - 13(2)^2 + 17(2) + 12$$

= (2 * 8) − (13 * 4) + (17 * 2) + 12

= 16 − 52 + 34 + 12

= 10

therefore f(2) = 10

2. f(-3)

we need to substitute the ‘ (-3) ‘ in f(x)

f(-3) =$2(-3)^3 - 13(-3)^2 + 17(-3) + 12$

= (2 * -27) − (13 * 9) − (17 * 3) + 12

= -54 − 117 − 51 + 12

= -210

therefore f(-3) = -210

3. f(0)

we need to substitute the ‘ (0) ‘ in f(x)

$$f(0) = 2(0)^3 - 13(0)^2 + 17(0) + 12$$

= (2 * 0) − (13 * 0) + (17 * 0) + 12

= 0 − 0 + 0 + 12

= 12

therefore f(0) = 12

Q2. Verify whether the indicated numbers are zeros of the polynomial corresponding to them in the following cases :

1. $f(x) = 3x + 1, x = \frac{-1}{3}$
2. $f(x) = x^2 - 1, x = (1, -1)$
3. $g(x) = 3x^2 - 2$ **, x = (** $\frac{2}{\sqrt{3}}$ **,** $\frac{-2}{\sqrt{3}}$ **)**
4. $p(x) = x^3 - 6x^2 + 11x - 6$ **, x = 1, 2, 3**
5. $f(x) = 5x - \pi, x = \frac{4}{5}$

6. $f(x) = x^2$ **, x = 0**
7. $f(x) = lx + m, x = \frac{-m}{l}$
8. $f(x) = 2x + 1, x = \frac{1}{2}$

Sol :

(1) $f(x) = 3x + 1, x = \frac{-1}{3}$

we know that ,

f(x) = 3x + 1

substitute x = $\frac{-1}{3}$ in f(x)

f($\frac{-1}{3}$) = 3($\frac{-1}{3}$) + 1

= -1 + 1

= 0

Since, the result is 0 x = $\frac{-1}{3}$ is the root of 3x + 1

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

we know that,

f(x) =x^2 − 1

Given that x = (1 , -1)

substitute x = 1 in f(x)

f(1) = 1^2 − 1

= 1 − 1

= 0

Now , substitute x = (-1) in f(x)

f(-1) = $(-1)^2$ − 1

= 1 − 1

= 0

Since , the results when x = (1 , -1) are 0 they are the roots of the polynomial f(x) = x^2 − 1

(3) $g(x) = 3x^2 - 2$, x = ($\frac{2}{\sqrt{3}}$, $\frac{-2}{\sqrt{3}}$)

Sol :

We know that

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

Given that , x = ($\frac{2}{\sqrt{3}}$, $\frac{-2}{\sqrt{3}}$)

Substitute x = $\frac{2}{\sqrt{3}}$ in g(x)

g($\frac{2}{\sqrt{3}}$) = 3$(\frac{2}{\sqrt{3}})^2$ − 2

= $3(\frac{4}{3})$ − 2

= 4 − 2

= 2 ≠ 0

Now, Substitute x = $\frac{-2}{\sqrt{3}}$ in g(x)

g($\frac{-2}{\sqrt{3}}$) = 3$(\frac{-2}{\sqrt{3}})^2 - 2$

= $3(\frac{4}{3})$ − 2

= 4 − 2

= 2 ≠ 0

Since, the results when x = ($\frac{2}{\sqrt{3}}$, $\frac{-2}{\sqrt{3}}$) are not 0, they are roots of$3x^2 - 2$

(4) $p(x) = x^3 - 6x^2 + 11x - 6$, x = 1, 2, 3

Sol :

We know that ,

p(x) = $x^3 - 6x^2 + 11x - 6$

given that the values of x are 1, 2 , 3

substitute x = 1 in p(x)

p(1) = $1^3 - 6(1)^2 + 11(1) - 6$

= 1 − (6 * 1) + 11 − 6

= 1 − 6 + 11 − 6

= 0

Now, substitute x = 2 in p(x)

P(2) =$2^3 - 6(2)^2 + 11(2) - 6$

= (2 * 3) − (6 * 4) + (11 * 2) − 6

= 8 − 24 − 22 − 6

= 0

Now, substitute x = 3 in p(x)

P(3) = $3^3 - 6(3)^2 + 11(3) - 6$

= (3 * 3) − (6 * 9) + (11 * 3) − 6

= 27 − 54 + 33 − 6

= 0

Since , the result is 0 for x = 1, 2, 3 these are the roots of $x^3 - 6x^2 + 11x - 6$

(5) $f(x) = 5x - \pi, x = \frac{4}{5}$

we know that ,

f(x) = $5x - \pi$

Given that , x = $\frac{4}{5}$

Substitute the value of x in f(x)

$f(\frac{4}{5}) = 5(\frac{4}{5}) - \pi$

= 4 − π

≠ 0

Since , the result is not equal to zero , x = $\frac{4}{5}$ is not the root of the polynomial 5x − π

(6) $f(x) = x^2$, x = 0

Sol :

we know that , f(x) = x^2

Given that value of x is ‘ 0 ’

Substitute the value of x in f(x)

f(0) = 0^2

= 0

Since, the result is zero , x = 0 is the root of x^2

(7) $f(x) = lx + m, x = \frac{-m}{l}$

Sol :

We know that,

f(x) = lx + m

Given , that x = $\frac{-m}{l}$

Substitute the value of x in f(x)

$f(\frac{-m}{l}) = l(\frac{-m}{l}) + m$

= -m + m

= 0

Since, the result is 0 , x = $\frac{-m}{l}$ is the root of lx + m

(8) $f(x) = 2x + 1, x = \frac{1}{2}$

Sol :

We know that ,

f(x) = 2x + 1

Given that x = $\frac{1}{2}$

Substitute the value of x and f(x)

f($\frac{1}{2}$) = 2($\frac{1}{2}$) + 1

= 1 + 1

= 2 ≠ 0

Since , the result is not equal to zero

x = $\frac{1}{2}$ is the root of 2x + 1

Q3. If x = 2 is a root of the polynomial f(x) = $2x^2 - 3x + 7a$, Find the value of a

Sol :

We know that , f(x) = $2x^2 - 3x + 7a$

Given that x = 2 is the root of f(x)

Substitute the value of x in f(x)

f(2) = $2(2)^2 - 3(2) + 7a$

= (2 * 4) − 6 + 7a

= 8 − 6 + 7a

= 7a + 2

Now, equate 7a + 2 to zero

=> 7a + 2 = 0

=> 7a = -2

=> a = $\frac{-2}{7}$

The value of a = $\frac{-2}{7}$

Q4. If x = $\frac{-1}{2}$ is zero of the polynomial p(x) = $8x^3 - ax^2 - x + 2$, Find the value of a

Sol :

We know that , p(x) = $8x^3 - ax^2 - x + 2$

Given that the value of x = $\frac{-1}{2}$

Substitute the value of x in f(x)

p($\frac{-1}{2}$) = $8(\frac{-1}{2})^3 - a(\frac{-1}{2})^2 - (\frac{-1}{2}) + 2$

= $-8(\frac{1}{8}) - a(\frac{1}{4}) + \frac{1}{2} + 2$

= -1 − ($\frac{a}{4} + \frac{1}{2}$ + 2

= 1 − ($\frac{a}{4} + \frac{1}{2}$

= $\frac{3}{2} - \frac{a}{4}$

To , find the value of a , equate p($\frac{-1}{2}$) to zero

p($\frac{-1}{2}$) = 0

$\frac{3}{2} - \frac{a}{4}$ = 0

On taking L.C.M

$\frac{6-a}{4}$ = 0

=> 6 − a = 0

=> a = 6

Q5. If x = 0 and x = -1 are the roots of the polynomial f(x) = $2x^3 - 3x^2 + ax + b$, Find the of a and b.

Sol :

We know that , f(x) = $2x^3 - 3x^2 + ax + b$

Given , the values of x are 0 and -1

Substitute x = 0 in f(x)

f(0) = $2(0)^3 - 3(0)^2 + a(0) + b$

= 0 − 0 + 0 + b

= b ——— 1

Substitute x = (-1) in f(x)

f(-1) = $2(-1)^3 - 3(-1)^2 + a(-1) + b$

= -2 − 3 − a + b

= -5 − a + b ————- 2

We need to equate equations 1 and 2 to zero

b = 0 and -5 − a + b = 0

since, the value of b is zero

substitute b = 0 in equation 2

=> -5 − a = -b

=> -5 − a = 0

a = -5

the values of a and b are -5 and 0 respectively

Q6. Find the integral roots of the polynomial f(x) = $x^3 + 6x^2 + 11x + 6$

Sol :

Given , that f(x) = $x^3 + 6x^2 + 11x + 6$

Clearly we can say that, the polynomial f(x) with an integer coefficient and the highest degree term coefficient which is known as leading factor is 1.

So, the roots of f(x) are limited to integer factor of 6, they are

±1, ±2, ±3, ±6

Let x = -1

f(-1) = $(-1)^3 + 6(-1)^2 + 11(-1) + 6$

= -1 + 6 -11 + 6

= 0

Let x = -2

f(-2) = $(-2)^3 + 6(-2)^2 + 11(-2) + 6$

= -8 – (6 * 4) – 22 + 6

= -8 + 24 – 22 + 6

= 0

Let x = -3

f(-3) = $(-3)^3 + 6(-3)^2 + 11(-3) + 6$

= -27 – (6 * 9) – 33 + 6

= -27 + 54 – 33 + 6

= 0

But from all the given factors only -1 , -2 , -3 gives the result as zero .

So, the integral multiples of $x^3 + 6x^2 + 11x + 6$ are -1 , -2 , -3

Q7. Find the rational roots of the polynomial f(x) = $2x^3 + x^2 – 7x – 6$

Sol :

Given that f(x) = $2x^3 + x^2 – 7x – 6$

f(x) is a cubic polynomial with an integer coefficient . If the rational root in the form of $\frac{p}{q}$, the values of p are limited to factors of 6 which are ±1, ±2, ±3, ±6

and the values of q are limited to the highest degree coefficient i.e 2 which are ±1, ±2

here, the possible rational roots are

±1, ±2, ±3, ±6, $\pm\frac{1}{2}, \pm\frac{3}{2}$

Let , x = -1

f(-1) = $2(-1)^3 + (-1)^2 – 7(-1) – 6$

= -2 + 1 +7 − 6

= -8 + 8

= 0

Let , x = 2

f(-2) = $2(2)^3 + (2)^2 - 7(2) - 6$

= (2 * 8) + 4 -14 − 6

= 16 + 4 -14 − 6

= 20 − 20

= 0

Let , x = $\frac{-3}{2}$

f($\frac{-3}{2}$) = $2(\frac{-3}{2})^3$ + ($\frac{-3}{2})^2$ − 7($\frac{-3}{2}$) − 6

= $2(\frac{-27}{8}) + \frac{9}{4} - 7(\frac{-3}{2}) - 6$

= $(\frac{-27}{4}) + \frac{9}{4} - (\frac{-21}{2}) - 6$

= -6.75 + 2.25 + 10.5 − 6

= 12.75 − 12.75

= 0

But from all the factors only -1 , 2 and $\frac{-3}{2}$ gives the result as zero

So, the rational roots of $2x^3 + x^2 - 7x - 6$ are -1 , 2 and $\frac{-3}{2}$