



## Exercise 2D

Question 15:

$$\text{Let } f(x) = x^3 - 3x^2 - 13x + 15$$

$$\text{Now, } x^2 + 2x - 3 = x^2 + 3x - x - 3$$

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

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

Thus,  $f(x)$  will be exactly divisible by  $x^2 + 2x - 3 = (x + 3)(x - 1)$  if  $(x + 3)$  and  $(x - 1)$  are both factors of  $f(x)$ , so by factor theorem, we should have  $f(-3) = 0$  and  $f(1) = 0$ .

$$\text{Now, } f(-3) = (-3)^3 - 3(-3)^2 - 13(-3) + 15$$

$$= -27 - 3 \times 9 + 39 + 15$$

$$= -27 - 27 + 39 + 15$$

$$= -54 + 54 = 0$$

$$\text{And, } f(1) = 1^3 - 3 \times 1^2 - 13 \times 1 + 15$$

$$= 1 - 3 - 13 + 15$$

$$= 16 - 16 = 0$$

$$\therefore f(-3) = 0 \text{ and } f(1) = 0$$

So,  $x^2 + 2x - 3$  divides  $f(x)$  exactly.

Question 16:

$$\text{Let } f(x) = (x^3 + ax^2 + bx + 6)$$

Now, by remainder theorem,  $f(x)$  when divided by  $(x - 3)$  will leave a remainder as  $f(3)$ .

$$\text{So, } f(3) = 3^3 + a \times 3^2 + b \times 3 + 6 = 3$$

$$\Rightarrow 27 + 9a + 3b + 6 = 3$$

$$\Rightarrow 9a + 3b + 33 = 3$$

$$\Rightarrow 9a + 3b = 3 - 33$$

$$\Rightarrow 9a + 3b = -30$$

$$\Rightarrow 3a + b = -10 \dots(i)$$

Given that  $(x - 2)$  is a factor of  $f(x)$ .

By the Factor Theorem,  $(x - a)$  will be a factor of  $f(x)$  if  $f(a) = 0$  and therefore  $f(2) = 0$ .

$$f(2) = 2^3 + a \times 2^2 + b \times 2 + 6 = 0$$

$$\Rightarrow 8 + 4a + 2b + 6 = 0$$

$$\Rightarrow 4a + 2b = -14$$

$$\Rightarrow 2a + b = -7 \dots(ii)$$

Subtracting (ii) from (i), we get,

$$\Rightarrow a = -3$$

Substituting the value of  $a = -3$  in (i), we get,

$$\Rightarrow 3(-3) + b = -10$$

$$\Rightarrow -9 + b = -10$$

$$\Rightarrow b = -10 + 9$$

$$\Rightarrow b = -1$$

$$\therefore a = -3 \text{ and } b = -1.$$

\*\*\*\*\* END \*\*\*\*\*