Exercise 2.3 Page: 40

1. **Find the remainder when x^3+3x^2+3x+1 is divided by**

(i) x+1

Solution:

$x+1=0$

$\Rightarrow x=-1$

$\therefore$Remainder:

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

$=-1+3-3+1$

$=0$

(ii) $x-\frac{1}{2}$

Solution:

$x-\frac{1}{2}=0$

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

$\therefore$Remainder:

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

$=\frac{1}{8}+\frac{3}{4}+\frac{3}{2}+1$

$=\frac{27}{8}$

(iii) x

Solution:

$x=0$

$\therefore$Remainder:

$p(0)=(0)^3+3(0)^2+3(0)+1$

$=1$

(iv) $x+\pi$

Solution:

$x+\pi=0$

$\Rightarrow x=-\pi$

$\therefore$Remainder:

$p(0)=(-\pi)^3+3(-\pi)^2+3(-\pi)+1$

$=-\pi^3+3\pi^2-3\pi+1$

(v) 5+2x

Solution:

$5+2x=0$

$\Rightarrow 2x=-5$

$\Rightarrow x=-\frac{5}{2}$

$\therefore$Remainder:

$(-\frac{5}{2})^3+3(-\frac{5}{2})^2+3(-\frac{5}{2})+1=-\frac{125}{8}+\frac{75}{4}-\frac{15}{2}+1$

$=-\frac{27}{8}$

2. Find the remainder when x^3-ax^2+6x-a is divided by x-a.

Solution:

Let $p(x)=x^3-ax^2+6x-a$

$x-a=0$

$\therefore x=a$

Remainder:

$p(a)=(a)^3-a(a^2)+6(a)-a$

$=a^3-a^3+6a-a=5a$

3. Check whether 7+3x is a factor of $3x^3+7x$.

Solution:

$7+3x=0$

$\Rightarrow 3x=-7$ only if 7+3x divides $3x^3+7x$ leaving no remainder.

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

$\therefore$Remainder:

$3(\frac{-7}{3})^3+7(\frac{-7}{3})=-\frac{-343}{9}+\frac{-49}{3}$

$=\frac{-343-(49)3}{9}$

$=\frac{-343-147}{9}$

$=\frac{-490}{9}\neq 0$

$\therefore 7+3x$ is not a factor of $3x^3+7x$