Factorisation of Polynomials Ex 6.3 Q12

Answer :

Let us denote the given polynomials as

$$f(x) = x^3 + 3x^2 + 3x + 1,$$
$$g(x) = x + 1$$
$$\Rightarrow \quad g(x) = x - (-1),$$
$$h(x) = x - \frac{1}{2},$$
$$i(x) = x$$
$$\Rightarrow \quad i(x) = x - 0,$$
$$j(x) = x + \pi$$
$$\Rightarrow \quad j(x) = x - (-\pi),$$
$$k(x) = 5 + 2x$$
$$\Rightarrow \quad k(x) = 2\left\{x - \left(-\frac{5}{2}\right)\right\}$$

(i) We will find the remainder when $f(x)$ is divided by $g(x)$.

By the remainder theorem, when $f(x)$ is divided by $g(x)$ the remainder is

$$= f(-1)$$
$$= (-1)^3 + 3(-1)^2 + 3(-1) + 1$$
$$= -1 + 3 - 3 + 1$$
$$= \boxed{0}$$

(ii) We will find the remainder when $f(x)$ is divided by $h(x)$.

By the remainder theorem, when $f(x)$ is divided by $h(x)$ the remainder is

$$= f\left(\frac{1}{2}\right)$$
$$= \left(\frac{1}{2}\right)^3 + 3\left(\frac{1}{2}\right)^2 + 3\left(\frac{1}{2}\right) + 1$$
$$= \frac{1}{8} + \frac{3}{4} + \frac{3}{2} + 1$$
$$= \boxed{\frac{27}{8}}$$

(iii) We will find the remainder when $f(x)$ is divided by $i(x)$.

By the remainder theorem, when $f(x)$ is divided by $i(x)$ the remainder is

$$= f(0)$$
$$= (0)^3 + 3(0)^2 + 3(0) + 1$$
$$= 0 + 0 + 0 + 1$$
$$= \boxed{1}$$

(iv) We will find the remainder when $f(x)$ is divided by $j(x)$.

By the remainder theorem, when $f(x)$ is divided by $j(x)$ the remainder is

$$= f(-\pi)$$

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

$$= \boxed{-\pi^3 + 3\pi^2 - 3\pi + 1}$$

(v) We will find the remainder when $f(x)$ is divided by $k(x)$.

By the remainder theorem, when $f(x)$ is divided by $k(x)$ the remainder is

$$= f\left(-\frac{5}{2}\right)$$

$$= \left(-\frac{5}{2}\right)^3 + 3\left(-\frac{5}{2}\right)^2 + 3\left(-\frac{5}{2}\right) + 1$$

$$= -\frac{125}{8} + \frac{75}{4} - \frac{15}{2} + 1$$

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

*********** END **********