No.

IX H.W-5

1) If both $x-2$ and $x-\frac{1}{2}$ are factors of px^2+5x+r, then show that $p=r$.

2) If $p(x) = x^2-4x+3$, then evaluate $p(2)-p(-1)+p(\frac{1}{2})$

3) Find the zeroes of the polynomial

(i) $g(x) = 3-6x$ (ii) $q(x) = 2x-7$ (iii) $h(y) = 2y$

4) Find the zeroes of the polynomial $p(x) = (x-2)^2-(x+2)^2$

5) By actual division, find the quotient and remainder when x^4+1 is divided by $x-1$

6) By remainder theorem, find the remainder when $p(x) = x^3-3x^2+4x+50$ is divided by $g(x) = x-3$.

7) Check whether $p(x) = 2x^3-11x^2-4x+5$ is a multiple of $g(x) = 2x+1$

8) Show that $2x-3$ is a factor of $x+2x^3-9x^2+12$

9) For what value of a, $x+2a$ is a factor of $x^5-4a^2x^3+2x+2a+3$.

10) Factorise :- (i) $2x^2-7x-15$

(ii) $84-2r-2r^2$

11) Factorise :- (i) $3x^3-x^2-3x+1$

(ii) $x^3-6x^2+11x-6$

12) Evaluate using suitable identity

(i) $(103)^3$

(ii) 249^2-248^2

13) Factorise (i) $4x^2+20x+25$

(ii) $9y^2-66yz+121z^2$

(iii) $\left(2x+\frac{1}{3}\right)^2-\left(x-\frac{1}{2}\right)^2$

14) Expand :- $(-x+2y-3z)^2$

15) Factorise :- $25x^2+16y^2+4z^2-40xy+16yz-20xz$

16) Expand :- $\left(\frac{1}{x}+\frac{y}{3}\right)^3$

17) Factorise :- (i) $1-64a^3-12a+48a^2$

(ii) $8p^3+\frac{12}{5}p^2+\frac{6}{25}p+\frac{1}{125}$

No.
Date

IX H.W-5 (Answers)

1) Let $p(x) = px^2 + 5x + r$

Since $x-2$ is a factor of $p(x)$,

$$\boxed{p(2) = 0}$$

$\Rightarrow 2^2 \times p + 5 \times 2 + r = 0$

$\Rightarrow 4p + 10 + r = 0$

$\Rightarrow 4p + r = -10 \longrightarrow (1)$

Since $x - \frac{1}{2}$ is a factor of $p(x)$,

$$\boxed{p\left(\frac{1}{2}\right) = 0}$$

$\Rightarrow p \times \left(\frac{1}{2}\right)^2 + 5 \times \frac{1}{2} + r = 0$

$\Rightarrow \frac{p}{4} + \frac{5^{\times 2}}{2_{\times 2}} + r^{\times 4} = 0$

$\Rightarrow \frac{p + 10 + 4r}{4} = 0$

$\Rightarrow p + 10 + 4r = 0$

$\Rightarrow p + 4r = -10 \longrightarrow (2)$

From eq: (1) and (2), $4p + r = p + 4r$

$\Rightarrow \cancel{3}p = \cancel{3}r$

$\therefore \underline{\underline{p = r}}$

2) $p(x) = x^2 - 4x + 3$

$p(2) = (2)^2 - 4 \times 2 + 3 = 4 - 8 + 3 = 7 - 8 = \underline{\underline{-1}}$

$p(-1) = (-1)^2 - 4(-1) + 3 = 1 + 4 + 3 = \underline{8}$

$p\left(\frac{1}{2}\right) = \left(\frac{1}{2}\right)^2 - 4 \times \frac{1}{2} + 3 = \frac{1}{4} - \frac{\cancel{4}^2}{\cancel{2}_1} + 3 = \frac{1}{4} + 1 = \frac{1+4}{4} = \underline{\underline{\frac{5}{4}}}$

$\therefore p(2) - p(-1) + p\left(\frac{1}{2}\right) = -1 - 8 + \frac{5}{4} = -9 + \frac{5}{4} = \frac{-36+5}{4} = \underline{\underline{\frac{-31}{4}}}$

No.

Date

3) (i) put $g(x) = 0$

$\Rightarrow 3 - 6x = 0$

$\Rightarrow 3 = 6x$

$\therefore x = \frac{3}{6} = \frac{1}{2}$ is the zero of $g(x)$

(ii) put $q(x) = 0$

$\Rightarrow 2x - 7 = 0$

$\Rightarrow 2x = 7$

$x = \frac{7}{2}$ is the zero of $q(x)$

(iii) put $h(y) = 0$

$\Rightarrow 2y = 0$

$y = 0$ is the zero of $h(y)$

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

$= (x^2 + 4 - 4x) - (x^2 + 4 + 4x)$

$= \cancel{x^2} + \cancel{4} - 4x - \cancel{x^2} - \cancel{4} - 4x$

$= -8x$

put $p(x) = 0$

$\Rightarrow -8x = 0$

$x = 0$ is the zero of $p(x)$

5) Let $p(x) = x^4 + 0x^3 + 0x^2 + 0x + 1$

$$
\begin{array}{r|l}
 & x^3 + x^2 + x + 1 \\
\hline
x - 1 & x^4 + 0x^3 + 0x^2 + 0x + 1 \\
 & \underline{\overset{(-)}{\cancel{x^4}} \overset{(+)}{-} x^3} \\
 & \cancel{x^3} + 0x^2 + 0x + 1 \\
 & \underline{\overset{(-)}{\cancel{x^3}} \overset{(+)}{-} 1x^2} \\
 & \cancel{x^2} + 0x + 1 \\
 & \underline{\overset{(-)}{\cancel{x^2}} \overset{(+)}{-} x} \\
 & \cancel{x} + 1 \\
 & \underline{\overset{(-)}{\cancel{x}} \overset{(+)}{-} 1} \\
 & 2
\end{array}
$$

quotient $= x^3 + x^2 + x + 1$

remainder $= 2$

No.
Date

6) The remainder is $p(3) = (3)^3 - 3(3)^2 + 4 \times 3 + 50$

$= \cancel{27} - \cancel{27} + 12 + 50$

$= \underline{\underline{62}}$

7) $p\left(-\frac{1}{2}\right) = 2\left(-\frac{1}{2}\right)^3 - 11\left(-\frac{1}{2}\right)^2 - 4\left(-\frac{1}{2}\right) + 5$

$= \cancel{2}^{1} \times -\frac{1}{\cancel{8}\,4} - 11 \times \frac{1}{4} + \frac{\cancel{4}^{2}}{\cancel{2}\,1} + 5$

$= -\frac{1}{4} - \frac{11}{4} + 7$

$= -\frac{12}{4} + 7$

$= -3 + 7$

$= \underline{\underline{4}} \neq 0$. Thus $p(x)$ is not a multiple of $g(x)$

8) put $2x - 3 = 0$

$x = \frac{3}{2}$

Let $p(x) = x + 2x^3 - 9x^2 + 12$

$p\left(\frac{3}{2}\right) = \frac{3}{2} + 2\left(\frac{3}{2}\right)^3 - 9\left(\frac{3}{2}\right)^2 + 12$

$= \frac{3}{2} + \cancel{2}^{1} \times \frac{27}{\cancel{8}\,4} - 9 \times \frac{9}{4} + 12$

$= \frac{3}{2} + \frac{27}{4} - \frac{81}{4} + 12$

$= \frac{3}{2} - \frac{\cancel{54}^{27}}{\cancel{4}\,2} + 12$

$= -\frac{24}{2} + 12 = -12 + 12 = \underline{\underline{0}}$

Thus $2x - 3$ is a factor of $p(x)$

9) put $x + 2a = 0$

$x = -2a$

$\boxed{p(-2a) = 0}$

$\Rightarrow (-2a)^5 - 4a^2(-2a)^3 + 2(-2a) + 2a + 3 = 0$

$\Rightarrow \cancel{-32a^5} + \cancel{32a^5} - 4a + 2a + 3 = 0$

$\Rightarrow -2a + 3 = 0$

$\Rightarrow \cancel{+}\,2a = \cancel{+}3$

$\boxed{a = \frac{3}{2}}$

No.

Date

10) (i) $2x^2 - 7x - 15$

$= 2x^2 - 10x + 3x - 15$

$= 2x(x-5) + 3(x-5)$

$= (2x+3)(x-5)$

S P
-7 -30
$-10, 3$

(ii) $84 - 2r - 2r^2$

$= -2r^2 - 2r + 84$

$= -2r^2 - 14r + 12r + 84$

$= -2r(r+7) + 12(r+7)$

$= (r+7)(12-2r)$

$= 2(r+7)(6-r)$

S P
-2 -168
$-14, 12$

11) (i) Let $p(x) = 3x^3 - x^2 - 3x + 1$

$= x^2(3x-1) - 1(3x-1)$

$= (x^2-1)(3x-1)$

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

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

Factors of 6 are $\pm 1, \pm 2, \pm 3, \pm 6$

$p(1) = 1 - 6 + 11 - 6 = 12 - 12 = 0$

Thus $(x-1)$ is a factor of $p(x)$.

On dividing $p(x)$ by $(x-1)$,

$$
\begin{array}{r|l}
 & x^2 - 5x + 6 \\
\hline
x-1 & x^3 - 6x^2 + 11x - 6 \\
 & \underline{\cancel{x^3} - x^2} \\
 & -5x^2 + 11x - 6 \\
 & \underline{\cancel{-5x^2} + 5x} \\
 & 6x - 6 \\
 & \underline{\cancel{6x} - \cancel{6}} \\
 & 0
\end{array}
$$

Using division algorithm,

$p(x) = (x-1)(x^2 - 5x + 6)$

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

No.

Date

12) (i) $(103)^3 = (100+3)^3$

$(a+b)^3 = a^3 + b^3 + 3ab(a+b)$

$= (100)^3 + (3)^3 + 3 \times 100 \times 3 (100+3)$

$= 1000000 + 27 + 900 \times 103$

$= 1000000 + 27 + 92700$

$= \underline{\underline{1092727}}$

(ii) $249^2 - 248^2$

$a^2 - b^2 = (a+b)(a-b)$

$= (249+248)(249-248)$

$= 497 \times 1$

$= \underline{\underline{497}}$

13) (i) $4x^2 + 20x + 25 = (2x)^2 + 2 \times 2x \times 5 + (5)^2$

$a^2 + 2ab + b^2 = (a+b)^2$

$= (2x+5)^2$

$= \underline{\underline{(2x+5)(2x+5)}}$

(ii) $9y^2 - 66yz + 121z^2 = (3y)^2 - 2 \times 3y \times 11z + (11z)^2$

$a^2 - 2ab + b^2 = (a-b)^2$

$= (3y - 11z)^2$

(iii) $\left(2x + \frac{1}{3}\right)^2 - \left(x - \frac{1}{2}\right)^2$

$a^2 - b^2 = (a+b)(a-b)$

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

$= \left(3x + \frac{1 \times 2}{3 \times 2} - \frac{1 \times 3}{2 \times 3}\right)\left(x + \frac{1 \times 2}{3 \times 2} + \frac{1 \times 3}{2 \times 3}\right)$

$= \underline{\left(3x - \frac{1}{6}\right)}\left(x + \frac{5}{6}\right)$

No.

Date

14) $(a+b+c)^2 = a^2+b^2+c^2+2ab+2bc+2ca$

$(-x+2y-3z)^2$

$= x^2+4y^2+9z^2-4xy-12yz+6zx$

15) $25x^2+16y^2+4z^2-40xy+16yz-20xz$

$= (-5x)^2+(4y)^2+(2z)^2+2\times -5x\times 4y+2\times 4y\times 2z-2\times 5x\times 2z$

$a^2+b^2+c^2+2ab+2bc+2ca = (a+b+c)^2$

$= (-5x+4y+2z)^2$

16) $(a+b)^3 = a^3+3a^2b+3ab^2+b^3$

$\left(\frac{1}{x}+\frac{y}{3}\right)^3 = \left(\frac{1}{x}\right)^3+\cancel{3}\times\left(\frac{1}{x}\right)^2\times\frac{y}{\cancel{3}}+3\times\frac{1}{x}\times\left(\frac{y}{3}\right)^2+\left(\frac{y}{3}\right)^3$

$= \frac{1}{x^3}+\frac{y}{x^2}+\cancel{3}\times\frac{1}{x}\times\frac{y^2}{\cancel{9}\,3}+\frac{y^3}{27}$

$= \frac{1}{x^3}+\frac{y}{x^2}+\frac{y^2}{3x}+\frac{y^3}{27}$

17) (i) $1-64a^3-12a+48a^2$ $\quad [a^3-b^3-3a^2b+3ab^2=(a-b)^3]$

$=(1)^3-(4a)^3-3\times1^2\times4a+3\times1\times(4a)^2$

$=(1-4a)^3$

$=(1-4a)(1-4a)(1-4a)$

(ii) $8p^3+\frac{12}{5}p^2+\frac{6}{25}p+\frac{1}{125}$ $\quad [a^3+b^3+3a^2b+3ab^2=(a+b)^3]$

$=(2p)^3+\left(\frac{1}{5}\right)^3+3\times(2p)^2\times\frac{1}{5}+3\times2p\times\left(\frac{1}{5}\right)^2$

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

$=\left(2p+\frac{1}{5}\right)\left(2p+\frac{1}{5}\right)\left(2p+\frac{1}{5}\right)$