Using identities, find the value of

(i) 101^2

(ii) 98^2

(iii) $(0.98)^2$

(iv) 11×9

(v) $190 \times 190 - 10 \times 10$

Solution:

(i) $101^2 = (100 + 1)^2$

$= 100^2 + 2 \times 100 \times 1 + 1^2$

$= 10000 + 200 + 1 = 10201$

(ii) $98^2 = (100 - 2)^2$

$= 100^2 - 2 \times 100 \times 2 + 2^2$

$= 10000 - 400 + 4 = 9604$

(iii) $0.98^2 = (1 - 0.02)^2$

$= 1^2 - 2 \times 1 \times 0.02 + (0.02)^2$

$= 1 - 0.04 + 0.0004$

$= 0.9604$

(iv) $11 \times 9 = (10+1)(10-1)$

$= 10^2 - 1^2$

$= 99$

(v) $190 \times 190 - 10 \times 10 = 190^2 - 10^2$

$= (190 + 10)(190 - 10)$

$= 200 \times 180$

$= 36000$

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Factorize

(i) $9x^2 - y^2$

(ii) $(3 - x)^2 - 36x^2$

(iii) $(2x - 3y)^2 - (3y + 4y)^2$

(iv) $16x^4 - y^4$

Solution:

(i) $9x^2 - y^2 = (3x)^2 - (y)^2$

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

(ii) $(3 - x)^2 - 36x^2 = (3 - x)^2 - (6x)^2$

$= (3 - x + 6x)(3 - x - 6x)$

$= (3 + 5x)(3 - 7x)$

(iii) $(2x - 3y)^2 - (3x + 4y)^2 = (2x - 3y + 3x + 4y)(2x - 3y - 3x - 4y)$

$= (5x + y)(-x - 7y)$

$= -(5x + y)(x + 7y)$

(iv) $16x^4 - y^4 = (4x^2)^2 - (y^2)^2$

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

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

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Factorise

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

(ii) $5xy(5x + y) - 5y(5x + y)$

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

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

Solution:

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

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

(ii) $5xy(5x + y) - 5y(5x + y)$

$= 5y(5x + y)(x - 1)$

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

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

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

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

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Find the remainder when $y^3 + y^2 - 2y + 5$ is divided by $y - 5$.

Solution:

$$
\begin{array}{r|l}
 & y^2 + 6y + 28 \\
\hline
y - 5 & y^3 + y^2 - 2y + 5 \\
 & -(y^3 - 5y^2) \\
\hline
 & 6y^2 - 2y + 5 \\
 & -(6y^2 - 30y) \\
\hline
 & 28y + 5 \\
 & -(28y - 140) \\
\hline
 & 145
\end{array}
$$

Remainder = 145

Again, we should evaluate p(5)

Let $p(y) = y^3 + y^2 - 2y + 5$

$\therefore p(5) = 5^3 + 5^2 - 2 \times 5 + 5$

$= 125 + 25 - 10 + 5$

$= 145$

Thus, we find that $p(5)$ is the remainder when

$p(y)$ is divided by $y - 5$.

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