Exercise 5.3

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Question 1: Factorize $64a^3 + 125b^3 + 240a^2b + 300ab^2$
Solution:

$64a^3 + 125b^3 + 240a^2b + 300ab^2$

$= (4a)^3 + (5b)^3 + 3(4a)^2(5b) + 3(4a)(5b)^2$, which is similar to $a^3 + b^3 + 3a^2b + 3ab^2$

We know that, $a^3 + b^3 + 3a^2b + 3ab^2 = (a+b)^3$]

$= (4a+5b)^3$

Question 2: Factorize $125x^3 – 27y^3 – 225x^2y + 135xy^2$
Solution:
$125x^3 – 27y^3 – 225x^2y + 135xy^2$

Above expression can be written as $(5x)^3 – (3y)^3 – 3(5x)^2(3y) + 3(5x)(3y)^2$

Using: $a^3 – b^3 – 3a^2b + 3ab^2 = (a–b)^3$

$= (5x – 3y)^3$

Question 3: Factorize $8/27\ x^3 + 1 + 4/3\ x^2 + 2x$
Solution:

$8/27\ x^3 + 1 + 4/3\ x^2 + 2x$

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

$\left[\because x^3 + b^3 + 3x^2b + 3xb^2 = (x+b)^3\right]$

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

Question 4: Factorize $8x^3 + 27y^3 + 36x^2y + 54xy^2$
 Solution:

$8x^3 + 27y^3 + 36x^2y + 54xy^2$
Above expression can be written as $(2x)^3 + (3y)^3 + 3×(2x)2×3y + 3×(2x)(3y)^2$

Which is similar to $a^3 + b^3 + 3a^2b + 3ab^2 = (a + b)^3$]

Here a = 2x and b = 3y

$= (2x+3y)^3$
Therefore, $8x^3 + 27y^3 + 36x^2y + 54xy^2 = (2x+3y)^3$

Question 5: Factorize $a^3 − 3a^2b + 3ab^2 − b^3 + 8$
 Solution:
$a^3 − 3a^2b + 3ab^2 − b^3 + 8$

Using: $a^3 − b^3 − 3a^2b + 3ab^2 = (a−b)^3$

$= (a−b)^3 + 2^3$

Again , Using: $a^3 + b^3 = (a + b)(a^2 − ab + b^2)$]

$= (a−b+2)((a−b)^2−(a−b)^2 + 2^2)$

$= (a−b+2)(a^2+b^2−2ab−2(a−b)+4)$

$= (a−b+2)(a^2+b^2−2ab−2a+2b+4)$

$a^3 − 3a^2b + 3ab^2 − b^3 + 8 = (a−b+2)(a^2+b^2−2ab−2a+2b+4)$