

Show all necessary steps for full marks.

Question 2: (8 points): (R.3 Exercise 92): Perform division $\frac{10x^3 + 11x^2 - 2x + 3}{5x + 3} = ?$

Solution:

$$\begin{array}{r}
 2x^2 + x - 1 \\
 5x + 3 \overline{) 10x^3 + 11x^2 - 2x + 3} \\
 \underline{10x^3 + 6x^2} \\
 5x^2 - 2x \\
 \underline{5x^2 + 3x} \\
 -5x + 3 \\
 \underline{-5x - 3} \\
 6
 \end{array}$$

$$\frac{10x^3 + 11x^2 - 2x + 3}{5x + 3} = 2x^2 + x - 1 + \frac{6}{5x + 3}$$

$$10x^3 + 11x^2 - 2x + 3 = (5x + 3)(2x^2 + x - 1) + (6)$$

Question 2: (8 points): Given the polynomial $(3x - 2)^3 + (6x - 1)^2$.

(a): Write the polynomial in the standard form.

(b): Complete the following table:

The leading coefficient is	The constant term is	The coefficient of is x^2 is

Solution:

$$\begin{aligned}
 \text{(a): } (3x - 2)^3 + (6x - 1)^2 &= (3x)^3 - 3(3x)^2 \cdot 2 + 3(3x) \cdot 2^2 + 2^3 + (6x)^2 - 2(6x) + 1 \\
 &= 27x^3 - 54x^2 + 36x - 8 + 36x^2 - 12x + 1 \\
 &= 27x^3 - 18x^2 + 24x - 7
 \end{aligned}$$

(b):

The leading coefficient is	The constant term is	The coefficient of is x^2 is
27	-7	-18

Question 3: (9 points): Factor the following completely :

(a): $9x^2 + 3x - y - y^2$ (b): $x^6 + 7x^3 - 8$ (c): $4x^3 - 8x^2y - xy^2 + 2y^3$

Solution:

$$\begin{aligned} \text{(a): } 9x^2 + 3x - y - y^2 &= (3x^2) - y^2 + 3x - y \\ &= (3x + y)(3x - y) + (3x - y) \\ &= (3x - y)(3x + y + 1) \end{aligned}$$

$$\begin{aligned} \text{(b): } x^6 + 7x^3 - 8 &= (x^3 + 8)(x^3 - 1) \\ &= (x^3 + 2^3)(x^3 - 1^3) \\ &= (x + 2)(x^2 - 2x + 4)(x - 1)(x^2 + x + 1) \end{aligned}$$

$$\begin{aligned} \text{(c): } 4x^3 - 8x^2y - xy^2 + 2y^3 &= 4x^2(x - 2y) - y^2(x - 2y) \\ &= (x - 2y)(4x^2 - y^2) \\ &= (x - 2y)[(2x)^2 - y^2] \\ &= (x - 2y)(2x + y)(2x - y) \end{aligned}$$