

Question 1

(a) Simplify $(6x-3)(2x-1)$.

$$(6x-3)(2x-1) = 12x^2 - 12x + 3$$

(b) Simplify $(3x^3 - 2x^2 - 3x + 2) \div (x-1)$.

$\begin{array}{r} 3x^2 + x - 2 \\ x-1 \overline{) 3x^3 - 2x^2 - 3x + 2} \\ \underline{3x^3 - 3x^2} \\ x^2 - 3x + 2 \\ \underline{x^2 - x} \\ -2x + 2 \\ \underline{-2x + 2} \\ 0 \end{array}$ <p>Answer = $3x^2 + x - 2$.</p>	<p>Or:</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <tr> <td></td> <td>$3x^2$</td> <td>x</td> <td>-2</td> </tr> <tr> <td>x</td> <td>$3x^3$</td> <td>x^2</td> <td>$-2x$</td> </tr> <tr> <td>-1</td> <td>$-3x^2$</td> <td>$-x$</td> <td>2</td> </tr> </table> <p>Answer = $3x^2 + x - 2$.</p>		$3x^2$	x	-2	x	$3x^3$	x^2	$-2x$	-1	$-3x^2$	$-x$	2
	$3x^2$	x	-2										
x	$3x^3$	x^2	$-2x$										
-1	$-3x^2$	$-x$	2										

(c) (i) Solve the simultaneous equations:

$$2x - 3y = 18 \quad \text{①}$$

$$5x + 9y = -10 \quad \text{②}$$

① $\times 3$: $6x - 9y = 54$

②: $5x + 9y = -10$

$$\begin{array}{r} 11x = 44 \\ \div 11: \quad x = 4 \end{array}$$

Sub in $x = 4$ in ①:

$$\begin{array}{r} 2(4) - 3y = 18 \\ 8 - 3y = 18 \\ -3y = 18 - 8 \\ -3y = 10 \end{array}$$

$\times(-1)$: $3y = -10$

$\div 3$: $y = -10 \div 3 = -10/3$ or equivalent

Answer: $x = 4$ and $y = -10/3$.

(ii) Verify your answer to (c)(i).

Note: Only need to check the equation that **wasn't** used to find the second variable. In this case, we only need use ②.

$$5(4) + 9\left(-\frac{10}{3}\right) = 20 - 30 = -10.$$

Question 2

(a) Express in its simplest form: $\frac{5-x}{5} + \frac{x-4}{4}$.

$$\frac{4(5-x) + 5(x-4)}{20} = \frac{x}{20}$$

(b) Solve for x : $3x^2 + 11x = 4$.

$$\begin{aligned} 3x^2 + 11x - 4 &= 0 \\ (3x-1)(x+4) &= 0 \\ x = \frac{1}{3} \quad x &= -4 \end{aligned}$$

$$\begin{aligned} 3x^2 + 11x - 4 &= 0 \\ x &= \frac{-11 \pm \sqrt{11^2 - 4(3)(-4)}}{2(3)} \\ x &= \frac{-11 \pm 13}{6} \\ x = \frac{1}{3} \quad x &= -4 \end{aligned}$$

(c) Divide $2x^3 + x^2 - 13x + 6$ by $x + 3$.

Method A

$$\begin{array}{r} 2x^2 - 5x + 2 \\ x+3 \overline{) 2x^3 + x^2 - 13x + 6} \\ \underline{2x^3 + 6x^2} \\ -5x^2 - 13x \\ \underline{-5x^2 - 15x} \\ 2x + 6 \\ \underline{2x + 6} \\ 0 \end{array}$$

Method B

	ax^2	bx	c
x	ax^3	bx^2	cx
$+3$	$3ax^2$	$3bx$	$3c$

$$\begin{aligned} ax^3 &= 2x^3 \Rightarrow a = 2 \\ \text{-----} \\ x^2(3a+b) &= -5 \Rightarrow 3a+b = -5 \\ \Rightarrow 6+b &= -5 \Rightarrow b = -11 \\ \text{-----} \\ 3c &= 6 \Rightarrow c = 2 \end{aligned}$$