3 **(a)** The function $f(x) = ax^3 + bx^2 - 11x + c$, where a, b and c are constants, is exactly divisible by $x - 3$. Given that $f(x)$ leaves a remainder of -6 and 6 when divided by $(1 - x)$ and x respectively. Find the values of a, b and c. [4]

(b) **(i)** Solve the cubic equation $3x^3 - x^2 = 8x + 4$. [4]

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a) $f(x) = Ax^3 + Bx^2 - 11x + C$

$f(1) = A + B - 11 + C = -6$

$A + B + C = 5 \quad -(1)$

when $x = 1$, $R = -6$

$f(0) = 6$

$C = 6$ // Ans

when $x = 0$, $R = 6$

$f(3) = 27A + 9B - 33 + 6 = 0$

$3A + B - 3 = 0 \quad -(2)$

when $x = 3$, $R = 0$

From (1), $B = -1 - A \quad -(3)$

Sub (3) into (2)

$3A + (-1 - A) - 3 = 0$

$A = 2$ // Ans

$B = -3$ // Ans

o.

b(i) $3x^3 - x^2 = 8x + 4$

Let $f(x) = 3x^3 - x^2 - 8x - 4$

$f(x) = (x+1)(3x^2 - 4x - 4)$

$f(-1) = 0$

$x+1$ is factor of $f(x)$

$(x+1)(3x+2)(x-2) = 0$

$x = -1$ or $x = -\frac{2}{3}$ or $x = 2$

b(ii) Let $x = y + 1$ $\quad$ $(y+1)$ is the new x

$3(y+1)^3 - (y+1)^2 - 8(y+1) - 4 = 0$

$y+1 = -1$ or $y+1 = -\frac{2}{3}$ or $y+1 = 2$

$y = -2$ or $y = -1\frac{2}{3}$ or $y = 1$