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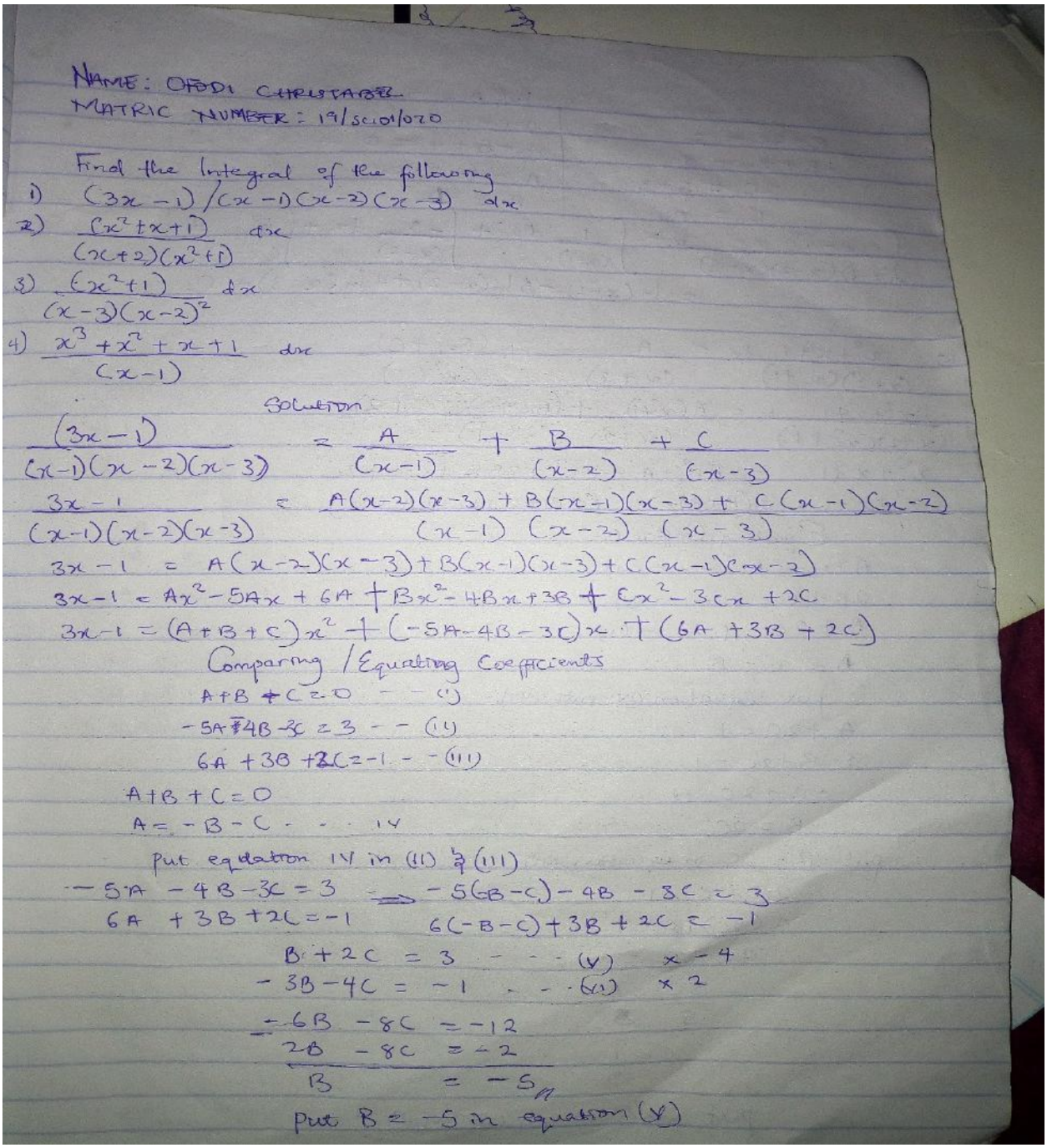
MATRIC NUMBER: 19/sci01/070



$B + 2C = 3$

$-5 + 2C = 3$

$2C = 5 + 3$

$C = 4$

Put $B = -5$ & $C = 4$ in equation (i)

$A + B + C = 0$

$A - 5 + 4 = 0$

$A - 1 = 0$

$A = 1$

$$\int \frac{(3x-1)}{(x-1)(x-2)(x-3)}\,dx = \int \frac{1}{(x-1)}\,dx + \int \frac{-5}{(x-2)}\,dx + \int \frac{4}{(x-3)}\,dx$$

$$= \ln(x-1) - 5\ln(x-2) + 4\ln(x-3) + C$$

2) $$\frac{x^2+x+1}{(x+2)(x^2+1)}\,dx = \frac{A}{(x+2)} + \frac{(Bx+C)}{(x^2+1)}$$

$$\frac{x^2+x+1}{(x+2)(x^2+1)}\,dx = \frac{A(x^2+1) + (Bx+C)(x+2)}{(x+2)(x^2+1)}$$

$x^2 + x + 1 = Ax^2 + A + Bx^2 + 2Bx + Cx + 2C$

$x^2 + x + 1 = (A+B)x^2 + (2B+C)x + (A+2C)$

Equating Coefficients

$A + B = 1 \quad \cdots (i)$

$2B + C = 1 \quad \cdots (ii)$

$A + 2C = 1 \quad \cdots (iii)$

$A = 1 - B \quad \cdots (iv)$

put equation (iv) into (iii)

$A + 2C = 1$

$1 - B + 2C = 1$

$-B + 2C = 0$

$B = 2C$

put $B = 2C$ in equation (ii)

$2B + C = 1$

$2(2C) + C = 1$

$4C + C = 1$

$\frac{5C}{5} = \frac{1}{5}$

$\therefore C = \frac{1}{5}$

put $C = 1/5$ in equation (iii).

$A + 2C = 1$

$A + 2(1/5) = 1$

$A + 2/5 = 1$

$A = 3/5$

Put $A = 3/5$ in equation (1)

$A + B = 1$

$3/5 + B = 1$

$B = 1 - 3/5$

$B = 2/5$

$$\therefore \int \frac{(x^2+x+1)}{(x+2)(x^2+1)}\,dx = \frac{3\ln(x+2)}{5} + \frac{2x+1}{5}\ln(x^2+1) + C$$

3. $$\frac{(x^2+1)}{(x-3)(x-2)^2}\,dx = \frac{A}{(x-3)} + \frac{B}{(x-2)} + \frac{C}{(x-2)^2}$$

$$\frac{x^2+1}{(x-3)(x-2)^2} = \frac{A(x-2)^2 + B(x-3)(x-2) + C(x-3)}{(x-3)(x-2)^2}$$

$x^2+1 = Ax^2 - 4Ax + 4A + Bx^2 - 5Bx + 6B + Cx - 3C$

$x^2+1 = (A+B)x^2 + (-4A-5B+C)x + (4A+6B-3C)$

Equating the Coefficients

$A + B = 1$ --- (i)

$-4A - 5B + C = 0$ --- (ii)

$4A + 6B - 3C = 1$ --- (iii)

$A = 1 - B$ --- (iv)

put equation (iv) into (ii) & (iii)

$-4A - 5B + C = 0 \Rightarrow -4(1-B) - 5B + C = 0 \Rightarrow -B + C = 4$ --- (v)

$4A + 6B - 3C = 1 \quad 4(1-B) + 6B - 3C = 0 \quad 2B - 3C = -3$ --- (vi)

$\therefore 3B - 3C = -12$

$-2B - 3C = -3$

$B = -9$

put B in equation (v)

$A + B = 1$

$A + (-9) = 1$

$A = 10$

put B in equation (v)

$-B + C = 4$

$-(-9) + C = 4$

$C = 4 - 9$

$C = -5$

$$\therefore \int \frac{x^2+1}{(x-3)(x-2)^2}\,dx = \int \frac{10}{(x-3)}\,dx + \int \frac{-9}{(x-2)}\,dx + \int \frac{-5}{(x-2)^2}\,dx$$

$$= 10\ln(x-3) - 9\ln(x-2) + 5(x-2)^{-1} + C$$

$$= 10\ln(x-3) - 9\ln(x-2) + \frac{5}{(x-2)} + C$$

4 $\int \frac{x^3+x^2+x+1}{(x-1)}\,dx$

$$x-1 \;\overline{)\; x^3+x^2+x+1 \;}\;\; x^2+2x+3$$

$x^3 - x^2$

$2x^2 + x$

$2x^2 - 2x$

$3x + 1$

$3x - 3$

4

$$\therefore \int (x^2+2x+3)\,dx + \int \frac{4}{(x-1)}\,dx$$

$$\Rightarrow \frac{x^3}{3} + \frac{x^2}{x} + 3x + 4\ln(x-1) + C$$

$$= \frac{x^3}{3} + x^2 + 3x + 4\ln(x-1) + C$$

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