

CHUKWUEMEKA EVANGEL  
 MEDICINE AND SURGERY  
 19/MHS01/130  
 MAT 104 ASSIGNMENT

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

Resolving into partial fractions

$$\frac{11-3x}{(x+3)(x-1)} = \frac{A}{x+3} + \frac{B}{x-1}$$

$$\frac{11-3x}{(x+3)(x-1)} = \frac{A(x-1)}{(x+3)(x-1)} + \frac{B(x+3)}{(x+3)(x-1)}$$

$$\therefore 11-3x = A(x-1) + B(x+3)$$

When  $x=1$

$$11-3(1) = A(1-1) + B(1+3)$$

$$11-3 = A(0) + B(4)$$

$$8 = 4B$$

$$B = 2$$

When  $x=-3$

$$11-3(-3) = A(-3-1) + B(-3+3)$$

$$11+9 = A(-4) + B(0)$$

$$20 = -4A$$

$$A = -5$$

$$\therefore \frac{11-3x}{(x+3)(x-1)} = \frac{-5}{x+3} + \frac{2}{x-1}$$

$$\therefore \int \frac{11-3x}{(x+3)(x-1)} dx = \int \frac{-5}{x+3} dx + \int \frac{2}{x-1} dx$$

$$\int \frac{11-3x}{(x+3)(x-1)} dx = -5 \int \frac{1}{x+3} + 2 \int \frac{1}{x-1} + c$$

$$2 \int \frac{4x-16}{x^2-2x-3} dx$$

$$= \int \frac{4x-16}{x^2-3x+x-3} dx$$

$$= \int \frac{4x-16}{(x^2-3x)+(x-3)} dx$$

$$= \int \frac{4x-16}{x(x-3)+1(x-3)} dx$$

$$= \int \frac{4x-16}{(x+1)(x-3)} dx$$

Resolving into partial fractions

$$\frac{4x-16}{(x+1)(x-3)} = \frac{A}{x+1} + \frac{B}{x-3}$$

$$\frac{4x-16}{(x+1)(x-3)} = \frac{A(x-3) + B(x+1)}{(x+1)(x-3)}$$

$$\therefore 4x-16 = A(x-3) + B(x+1)$$

When  $x=3$

$$4(3)-16 = A(3-3) + B(3+1)$$

$$12-16 = A(0) + B(4)$$

$$-4 = 4B$$

$$B = -1$$

when  $x=-1$

$$4(-1)-16 = A(-1-3) + B(-1+1)$$

$$-4-16 = A(-4) + B(0)$$

$$-20 = -4A$$

$$A = 5$$

$$\therefore \frac{4x-16}{(x+1)(x-3)} = \frac{5}{x+1} + \frac{-1}{x-3}$$

$$\int \frac{4x-16}{(x+1)(x-3)} dx = \int \frac{5}{x+1} dx - \int \frac{1}{x-3} dx$$

$$\int \frac{4x-16}{(x+1)(x-3)} dx = 5 \ln|x+1| - \ln|x-3| + C$$

$$3 \int \frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)} dx$$

Resolving into partial fractions

$$\frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)} = \frac{A}{x+1} + \frac{B}{x-2} + \frac{C}{x+3}$$

$$2x^2 - 9x - 35 = A(x-2)(x+3) + B(x+1)(x+3) + C(x+1)(x-2)$$

$$2x^2 - 9x - 35 = A(x-2)(x+3) + B(x+1)(x+3) + C(x+1)(x-2)$$

When  $x = 2$

$$2(2)^2 - 9(2) - 35 = A(2-2)(2+3) + B(2+1)(2+3) + C(2+1)(2-2)$$

$$2(4) - 18 - 35 = A(0)(5) + B(3)(5) + C(3)(0)$$

$$8 - 18 - 35 = 0 + 15B + 0$$

$$-45 = 15B$$

$$B = -3$$

When  $x = -1$

$$2(-1)^2 - 9(-1) - 35 = A(-1-2)(-1+3) + B(-1+1)(-1+3) + C(-1+1)(-1-2)$$

$$2(1) + 9 - 35 = A(-3)(3) + B(0)(2) + C(0)(-3)$$

$$2 + 9 - 35 = A(-9) + B(0) + C(0)$$

$$-24 = -9A$$

$$A = 4$$

$$2x^2 - 9x - 35 = A(x-2)(x+3) + B(x+1)(x+3) + C(x+1)(x-2)$$

$$2x^2 - 9x - 35 = A(x^2 + x - 6) + B(x^2 + 4x + 3) + C(x^2 - x - 2)$$

$$2x^2 - 9x - 35 = Ax^2 + Ax - 6A + Bx^2 + 4Bx + 3B + Cx^2 - Cx - 2C$$

$$2x^2 - 9x - 35 = Ax^2 + Bx^2 + Cx^2 + Ax + 4Bx - Cx - 6A + 3B - 2C$$

$$+ 3B - 2C$$

$$2x^2 - 9x - 35 = x^2(A+B+C) + x(A+4B-C) - 6A + 3B - 2C$$

Equating the coefficients of  $x^2$

$$A + B + C = 2$$

When  $A = 4$  and  $B = -3$

$$4 + (-3) + C = 2$$

$$4 - 3 + C = 2$$

$$1 + C = 2$$

$$C = 1$$

$$\frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)} = \frac{4}{x+1} - \frac{3}{x-2} + \frac{1}{x+3}$$

$$\therefore \int \frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)} dx = \int \frac{4}{x+1} dx - \int \frac{3}{x-2} dx + \int \frac{1}{x+3} dx$$

$$\therefore \int \frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)} dx = 4 \ln|x+1| - 3 \ln|x-2| + \ln|x+3| + C$$

$$\therefore \int \frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)} dx = 4 \ln|x+1| - 3 \ln|x-2| + \ln|x+3| + C$$