

## Assignment

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 Matriculation Number: 19/MHS01/236  
 Course Code: MAT 104

$$\textcircled{1} \int \frac{11-3x}{x^2+2x-3}$$

Soln

Factorize

$$(x^2+3x) - (x-3)$$

$$x(x+3) - 1(x-3)$$

$$(x+3)(x-1)$$

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

Multiply both sides by  $(x+3)(x-1)$   
 $11-3x = A(x-1) + B(x+3)$

Let  $x=1$ 

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

$$11-3=4B$$

$$8=4B$$

$$\boxed{B=2}$$

Let  $x=-3$ 

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

$$11+9 = -4A$$

$$20 = -4A$$

$$\boxed{A=-5}$$

Therefore

$$\int \frac{-5}{x+3} +$$

$$\int \frac{2}{x-1} dx = \int \frac{11-3x}{x^2+2x-3}$$

$$\text{Let } u = x+3$$

$$du = dx$$

$$\Rightarrow -5 \int \frac{du}{u}$$

$$\text{Let } u = x-1$$

$$du = dx$$

$$\Rightarrow 2 \int \frac{du}{u}$$

$$= -5 \ln(x+3)$$

$$\text{Ans} = -5 \ln(x+3)$$

OR

$$2 \ln(x-1)$$

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

Soln

Factorize

$$(x^2-3x) - (x-3)$$

$$x(x-3) - 1(x-3)$$

$$(x-3)(x-1)$$

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

$$(x-3)(x+1)$$

Multiply

$$-4x-16$$

$$4x-16$$

$$4x-$$

$$4x$$

Put

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$$= -5 \ln(x+3)$$

$$= 2 \ln(x-1)$$

$$\text{Ans} = -5 \ln(x+3) + 2 \ln(x-1) //$$

$$\text{OR} \\ 2 \ln(x-1) - 5 \ln(x+3) //$$

②  $\int \frac{4x-16}{x^2-2x-3} dx$

Soln

Factorize

$$(x^2-3x) - (x-3)$$

$$x(x-3) + 1(x-3)$$

$$(x-3)(x+1)$$

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

Multiply both sides by  $(x-3)(x+1)$

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

$$4x-16 = Ax + A + Bx - 3B$$

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

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

$$A + B = 4 \quad \text{--- eqn ①}$$

$$A - 3B = -16 \quad \text{--- eqn ②}$$

$$4B = 20$$

$$\boxed{B = 5}$$

Put  $B=5$  in eqn ①

$$A+B = 4$$

$$A+5 = 4$$

$$A = 4-5$$

$$\boxed{A = -1}$$

(3)

Therefore

$$\int \frac{-1}{x-3} dx + \int \frac{5}{x+1} dx = \int \frac{4x + 16}{x^2 - 2x - 3} dx$$

Let  $u = x - 3$

$du = dx$

$-1 \int \frac{dx}{u}$

Let  $u = x + 1$

$du = dx$

$5 \int \frac{dx}{u}$

$\Rightarrow -\ln u$

$-\ln(x-3)$

Ans =  $-\ln(x-3) + 5 \ln(x+1)$

OR

$5 \ln(x+1) - \ln(x-3)$

$$\frac{B}{1+x} + \frac{A}{x-3}$$

$$1+x \quad x-3$$

$$(1+x)(x-3) = 1+x^2 - 3x - 3x - 9 = 1+x^2 - 6x - 9$$

$$(x-3)B + (1+x)A = 1+x^2 - 6x - 9$$

$$Bx - 3B + A + Ax = 1+x^2 - 6x - 9$$

$$Bx - 3B + A + Ax = 1+x^2 - 6x - 9$$

$$(B+A)x + (-3B+A) = 1+x^2 - 6x - 9$$

① eqs - - - - -  $P = B + A$

② eqs - - - - -  $-3B + A = 1 - 6P - 9$

OS =  $B + A$