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Assignment 9

Assignment
Questions

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

$$\frac{11-3x}{x^2+2x-3} = \frac{11-3x}{(x-1)(x+3)} = \frac{A}{x-1} + \frac{B}{x+3}$$

multiply through by $(x-1)(x+3)$

$$11-3x = A(x+3) + B(x-1)$$
$$Ax + 3A + Bx - B = 11 - 3x$$
$$(A+B)x + (3A-B) = 11 - 3x$$
$$A+B = -3 \quad \text{--- (i) } \times 3$$
$$3A-B = 11 \quad \text{--- (ii) } \times 1$$
$$\begin{array}{r} 3A+B = -9 \\ -3A-B = 11 \\ \hline 4B = -20 \\ B = \frac{-20}{4} = -5 \end{array}$$

from eqn (i), $A+B = -3$

$$A-5 = -3$$
$$A = -3+5 = 2$$

$A=2, B=-5$

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

let $u = x-1$ let $v = x+3$
 $du = dx$ $dv = dx$

$$\Rightarrow 2 \int \frac{du}{u} \quad \Rightarrow -5 \int \frac{dv}{v}$$
$$= 2 \ln u \quad = -5 \ln v$$

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

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

$$\frac{4x-16}{x^2-2x-3} = \frac{4x-16}{(x-3)(x+1)} = \frac{A}{x-3} + \frac{B}{x+1}$$

multiply through by $(x-3)(x+1)$

$$A(x+1) + B(x-3) = 4x-16$$
$$Ax+A+Bx-3B = 4x-16$$
$$(A+B)x + (A-3B) = 4x-16$$
$$A+B = 4 \quad \text{--- (i)}$$
$$A-3B = -16 \quad \text{--- (ii)}$$
$$\begin{array}{r} 4B = 20 \\ B = \frac{20}{4} = 5 \end{array}$$

$A+B = 4$
 $A+5 = 4$
 $A = 4-5$
 $A = -1$ $A = -1, B = 5$

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

let $u = x-3$ let $v = x+1$
 $du = dx$ $dv = dx$

$$\Rightarrow -1 \int \frac{du}{u} \quad 5 \int \frac{dv}{v}$$

$$= -\ln u \quad = 5 \ln u$$

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

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

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

multiply through by $(x+1)(x-2)(x+3)$

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

using $x = -1$ or $x = 2$ or $x = -3$.

$$f(-1) \Rightarrow 2(-1)^2 - 9(-1) - 35 = A(-1-2)(-1+3)$$

$$2 + 9 - 35 = A(-3)(2)$$

$$-24 = -6A$$

$$A = 4$$

$$f(2) \Rightarrow 2(2)^2 - 9(2) - 35 = B(2+1)(2+3)$$

$$8 - 18 - 35 = B(3)(5)$$

$$-45 = 15B$$

$$B = -3$$

$$f(-3) \Rightarrow 2(-3)^2 - 9(-3) - 35 = C(-3+1)(-3-2)$$

$$18 + 27 - 35 = C(-2)(-5)$$

$$10 = 10C$$

$$C = 1$$

$A = 4, B = -3, C = 1$

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

let $u = x+1$ let $u = x-2$ let $u = x+3$
 $du = dx$ $du = dx$ $du = dx$

$$\Rightarrow 4 \ln u \quad \Rightarrow -3 \ln u \quad \Rightarrow \ln u$$

$$\Rightarrow 4 \ln(x+1) - 3 \ln(x-2) + \ln(x+3)$$