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Math 104.

General mathematics II

Assignment

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

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

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

Divide numerator by $(x-1)(x+3)$.

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

When $x = -3$

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

$$11+9 = -4B$$

$$B = \frac{20}{-4}$$

$$B = -5$$

When $x = 1$

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

$$8 = 4A$$

$$A = 2$$

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

(9/mt501/03)

$$\int \frac{11-3x}{x^2+2x+3} dx = 2 \ln|x-1| - 5 \ln|x+3| + C$$

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

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

Multiply all by $(x-3)(x+1)$

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

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

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

$$A+B = 4 \quad \text{--- } \textcircled{1}$$

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

$$\hline 4B = 20$$

$$B = 5 \quad \text{--- } \textcircled{3}$$

put eqn 3 in $\textcircled{1}$

$$A+5 = 4$$

$$A = 4-5$$

$$A = -1$$

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

$$\text{let } u = x-3$$

$$\text{let } u = x+1$$

$$\frac{du}{dx} = 1$$

$$\frac{du}{dx} = 1$$

$$dx = du$$

$$dx = du$$

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$$\therefore \frac{-1 \, dx}{u} + \frac{5 \, dx}{u}$$
$$-\ln(u-3) + 5\ln(u+1)$$
$$5\ln(u+1) - \ln(u-3) + C$$

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

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

$$\frac{A[x^2 + 3x - 2x - 6] + B[x^2 + 3x + x + 3] + C[x^2 - 2x + x - 2]}{(x+1)(x-2)(x+3)}$$

$$\frac{Ax^2 + Ax - 6A + Bx^2 + 4Bx + 3B + Cx^2 - 2Cx - 2C}{(x+1)(x-2)(x+3)}$$

$$\frac{x^2[A+B+C] + x[A+4B-2C] + [-6A+3B-2C]}{(x+1)(x-2)(x+3)}$$

$$A+B+C = 2 \quad \text{--- (1)}$$

$$A+4B-2C = -9 \quad \text{--- (2)}$$

$$-6A+3B-2C = -35 \quad \text{--- (3)}$$

$$A = 2 - B - C \quad \text{--- (4)}$$

Put eqn 4 in eqn 2 & 3.

$$2 - B - C + 4B - 2C = -9$$

$$2 - B + 4B - C - 2C = -9$$

$$2 + 3B - 2C = -9 \quad \text{--- (5)}$$

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$$\cancel{3B} + 3B - 2C = -9 - 2$$

$$3B - 2C = -11 \quad \text{--- 5}$$

$$-6A + 3B - 2C = -35$$

$$-6[2 - B - C] + 3B - 2C = -35$$

$$-12 + 6B + 6C + 3B - 2C = -35$$

$$6B + 3B + 6C - 2C = -35 + 12$$

$$9B + 4C = -23 \quad \text{--- 6}$$

~~Divide~~
~~Eqns 5 & 6 by 3~~

Solve eqn 5 & 6 simultaneously -

$$3B - 2C = -11 \quad \text{--- (5)}$$

$$9B + 4C = -23 \quad \text{--- (6)}$$

multiply eqn (5) by 4 and eqn (6) by 2 to get "C"

$$12B - 8C = -44$$

$$+ \quad 18B + 8C = -46$$

$$\hline 30B = -90$$

$$B = \frac{-90}{30}$$

$$B = \underline{\underline{-3}} \quad \text{--- (7)}$$

Put eqn (7) in eqn (6)

$$9(3) + 4C = -23$$

$$27 + 4C = -23$$

$$4C = -23 - 27$$

$$C =$$

put eqn (7) in (5)

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$$3B - 2C = -11$$

$$3(3) - 2C = -11$$

$$-9 - 2C = -11$$

$$-2C = -11 + 9$$

$$-2C = -2$$

$$C = 1 \quad \text{--- (8)}$$

put eqn 7 & 8 in eqn 1

$$A = 2 - B - C$$

$$A = 2 - (-3) - 1$$

$$A = 2 + 3 - 1$$

$$A = 4.$$

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

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

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