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Course: Math 104

Dept: MBB5

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

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

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

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

When  $x = -3$

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

$$f(-3) = 20 = B(-4)$$

$$B = \frac{20}{-4} = -5$$

When  $x = 1$

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

$$f(1) = 8 = A(4)$$

$$A = \frac{8}{4}$$

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

$$\int \frac{7}{x+1}$$

$$u = x-1, \frac{du}{dx} = 1, du = dx$$

$$\int \frac{2}{4} \cdot du$$

$$\frac{2}{4} \int \frac{1}{4} \cdot du$$

$$= \frac{2}{4} \ln 4$$

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

$$u = x+3, \frac{du}{dx} = 1$$

$$du = dx$$

$$\int \frac{-5}{4} \cdot du$$

$$= -5 \int \frac{1}{4} \cdot du$$

$$= -5 \ln 4$$

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

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

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

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

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

For  $x=3$

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

$$12 - 16 = A(4)$$

$$A = -1$$

$f(-1)$

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

$$-20 = B(-4)$$

$$B = 5$$

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

$$\frac{-1}{x-3}, u=x-3, \frac{du}{dx}=1,$$

$$dx=du$$

$$\int \frac{-1}{u} \cdot du$$

$$-1 \int \frac{1}{u} \cdot du$$

$$= -\ln u$$

$$\int \frac{5}{x+1}, u=x+1, \frac{du}{dx}=1, dx=du$$

$$\int \frac{5}{u} \cdot du$$

$$5 \int \frac{1}{u} \cdot du$$

$$= 5 \ln u$$

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

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

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

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

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

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

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

$$10 = 10C$$

$$C = 1$$

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

$$\text{let } x = 2$$

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

$$-46 = 15B$$

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

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

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