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Course Code: Math 104

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

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

$$= x^2+2x-3$$

$$= x^2-3x-x-3$$

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

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

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

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

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

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

$$11-3 = 4A + 0$$

$$4A = 8$$

$$A = 2$$

$$\bullet f(-3) \Rightarrow 11-3(-3) = A(-3+3) + B(-3-1)$$

$$11+9 = 0 + 4B$$

$$20 = 4B$$

$$\therefore B = 5$$

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

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

$$= 2 \ln|x-1| - 5 \ln|x+3|$$

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

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

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

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

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

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

$$12 - 16 = 0 + 4B$$

$$4B = -4$$

$$B = -1/4$$

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

$$-4 - 16 = -4A + 0$$

$$-20 = -4A$$

$$A = 5$$

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

$$= 5 \int \frac{1}{x+1} - \int \frac{1}{x+3}$$

$$= 5 \ln|x+1| - \ln|x+3|$$

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

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

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

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

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

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

$$-6A = -24$$

$$A = 4$$

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

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

$$15B = -45$$

$$B = -3$$

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

$$2(9) + 27 - 35 = 0 + 0 + C(-2)(-5)$$

$$10 = 10C$$

$$C = 1$$

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

$$= 4 \int \frac{1}{x+1} - 3 \int \frac{1}{x-2} + \int \frac{1}{x+3}$$

$$= 4 \ln|x+1| - 3 \ln|x-2| + \ln|x+3| + C$$