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

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

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

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

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

when $x = -3$

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

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

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

$$B = -5$$

when $x \neq -1$

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

$$\Rightarrow 11-4 = A(4)$$

$$7 = A(4)$$

$$\frac{7}{4} = A$$

$$\frac{11-3x}{(x-1)(x+3)} = \int \frac{7/4}{x-1} + \int \frac{-5}{x+3}$$

$$\int \frac{7/4}{x-1}$$

$$d = x-1, \quad dy = 1, \quad dx = dy$$

$$\int \frac{7/4 \cdot du}{u}$$

$$\frac{7}{4} \int \frac{1}{u} \cdot du$$

$$= \frac{7}{4} \ln u$$

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

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

$$dx = du$$

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

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

$$= -5 \ln u$$

$$\Rightarrow \frac{7}{4} \ln(x-1) - 5 \ln(x+3)$$

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

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

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

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

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

$$-4 = 4A$$

$$-4 = 4A$$

$$A = -1$$

$$f(-1) = 16 = 8B(-1-3)$$

$$-20 = 8B(-4)$$

$$-20 = -32B$$

$$B = \frac{5}{8}$$

$$\int \frac{4x-16}{(x-3)(x+1)} = \int \frac{-1}{x-3} + \int \frac{5}{8(x+1)}$$

$$\int \frac{-1}{x-3} = \ln|x-3| + C$$

$$\int \frac{5}{8(x+1)} = \frac{5}{8} \ln|x+1| + C$$

$$\int \frac{1}{u} \cdot \frac{du}{u} = \int \frac{1}{u^2} du = -\frac{1}{u} + C$$

$$\int \frac{1}{x+1} dx = \ln|x+1| + C$$

$$\int \frac{5}{u} du = 5 \ln|u| + C$$

$$= 5 \ln|x+1| + C$$

$$\int \frac{1}{x} dx = \ln|x| + C$$

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

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

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

$$10 = 10C$$

$$C = 1$$

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

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

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

$$-45 = 15B$$

$$-3 = B$$

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

$$\text{let } x = -1$$

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

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

$$-24 = -6A$$

$$4 = A$$

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

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