

NAME: EMMMA-IRVATENANTA ANUNYADANSON NITSON
 HOUSE CODE: MTH 104
 TEL NO: 19/mhs01/155
 DEPARTMENT: MEDICINE AND SURGERY

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

Solution:

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

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

$$2x^2 - 9x - 35 = A(x^2 + x - 6) + B(x^2 + 4x + 3) + C(x^2 - 2x - 2)$$

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f(-1)

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

$$-24 = -6A + 0 + 0$$

$$-24 = -6A \quad A = 4 //$$

f(-3)

$$10 = A(0) + B(0) + C(10)$$

$$10 = 10C$$

C = 1

f(2)

$$-45 = A(0) + B(15) + C(0)$$

$$-45 = 15B$$

$$B = -3 //$$

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

$$4(x-2)(x+3) - 3(x+1)(x+3) + 1(x+1)(x-2)$$

$$4(x-2)(x+3) - 3(x+1)(x+3) + 1(x+1)(x-2)$$

$$\int \frac{11-3x}{x^2+4x-8}$$

Solution:

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

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

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

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

$$8 = 4A$$

$$A = 2$$

$$f(0): 11-3(0) = A(0+3) + B(0-1)$$

$$11 = 3A - B$$

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

$$11-6 = 0 - B \quad -B = 5$$

$$B = -5$$

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

Integrate both sides with respect to x

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

$$\text{Let } u = x-1 \quad \frac{du}{dx} = 1 \quad dx = du$$

$$\int \frac{2}{u} \cdot du = \frac{2}{u} \int \frac{1}{u} \cdot du = 2 \ln |u|$$

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

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

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

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

$$\textcircled{8} \int \frac{4x-16}{x^2-2x-8}$$

Solution

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

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

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

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

$$-20 = -4A + 0$$

$$A = 5$$

$f(3)$

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

$$-4 = 4B$$

$$B = -1$$

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

Integrate both sides w.r.t x

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

$$\text{Let } u = x+1 \quad \frac{du}{dx} = 1 \quad dx = du$$

$$\int \frac{5}{u} \cdot du = \frac{5}{u} \int \frac{1}{u} \cdot du = 5 \ln |u|$$

$$\text{Let } u = x-3 \quad \frac{du}{dx} = 1 \quad dx = du$$

$$\int \frac{-1}{u} \cdot du = -\ln |u|$$

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

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