19/mhs01/217

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Department: Medicine and surgery
Course: Mat 104
Assignment

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

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

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

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

$x-1=0, \quad x+3=0$

$x=1, \quad x=-3$

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

$\Rightarrow 11+9 = 0+(-4B)$

$\Rightarrow 20 = -4B$

$B = -5$

$f(1) \Rightarrow 11-3(1) = A(1+3)+0$

$\Rightarrow 11-3 = 4A$

$\Rightarrow 8 = 4A$

$A = 2$

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

$\int \frac{2}{(x-1)} dx$, let $u = (x-1$

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

$dx = du$

$\int \frac{2}{u} \cdot du = 2\int \frac{1}{u} \cdot du = 2\ln u = 2\ln(x-1)$

$\int \frac{5}{(x+3)} dx$, let $u = (x+3)$

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

$dx = du$

$\int \frac{5}{u} \cdot du = 5\int \frac{1}{u} \cdot du = 5\ln u = 5\ln(x+3)$

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

where C is the constant for integration.

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

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

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

$x=-1,\ x=3$

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

$f(-1) \Rightarrow 4(-1)+16 = A(-1-3)+0$

$\Rightarrow -4-16 = -4A$

$\Rightarrow -20 = -4A$

$A = 5$

$f(3) \Rightarrow 4(3)-16 = 0+B(3+1)$

$12-16 = 4B$

$-4 = 4B$

$B = -1$

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

$\int \frac{5}{(x+1)}\,dx$ = let $u = x+1$

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

$dx = du$

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

$5\ln u = 5\ln(x+1)$

$\int \frac{1}{(x-3)}\,dx$, let $u = (x-3)$

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

$dx = du$

$$\int \frac{1}{u}\,du = \ln u$$

$\ln u = \ln(x-3)$

$$\int \frac{4x-16}{x^2-2x-3}\,dx = 5\ln(x+1) - \ln(x-3) + C$$

where c is the constant of integration

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

soln

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

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

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

$f(-1) \Rightarrow 2(-1)^2-9(-1)-35 = A(-1-2)(-1+3) + 0 + 0$

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

$-24 = -6A$

$A = 4$

$f(2) \Rightarrow 2(2)^2-9(2)-35 = 0 + B(2+1)(2+3) + 0$

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

$-45 = 15B$

$B = -3$

$f(-3) \Rightarrow 2(-3)^2-9(-3)-35 = 0+0+C(-3+1)(-3-2)$

$18+27-35 = C(-2)(-5)$

$10 = 10C$

$C = 1$

$A = 4,\ B = -3,\ C = 1$

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

$\int \frac{4}{x+1}$, let $p = x+1$

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

$dx = dp$

$\int \frac{4}{p} \cdot dp = 4\int \frac{1}{p} \cdot dp = 4\ln p$

$4\ln p = 4\ln(x+1)$

$\int \frac{3}{x-2}$, let $u = x-2$

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

$dx = du$

$\int \frac{3}{u} \cdot du = 3\int \frac{1}{u} \cdot du = 3\ln u$

$3\ln u = 3\ln(x-2)$

$\int \frac{1}{x+3}$, let $u = x+3$

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

$dx = du$

$\int \frac{1}{u} \cdot du = \ln u = \ln(x+3)$

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

where c is the constant for integration.