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DEPARTMENT: PHYSIOLOGY
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Assignment

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

x^2+2x-3

$x^2+3x-x-3 = x(x+3)-1(x+3)$

$= (x-1)(x+3)$ $[x-1=0, x=1 \quad x+3=0, x=-3]$

$\frac{11-3x}{x^2+2x-3} = \frac{11-3x}{(x-1)(x+3)} = \frac{A}{(x-1)} + \frac{B}{(x+3)} = \frac{A(x+3)+B(x-1)}{(x-1)(x+3)}$

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

$f(x)$ where $x=-3$

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

$11+9 = A(0) + B(-4)$

$20 = -4B$

$\therefore B = -5$

$f(x)$ where $x=1$

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

$11-3 = A(4) + B(0)$

$8 = 4A$

$\therefore A = 2$

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

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

$\int \frac{2}{x-1}dx$

Let $u = x-1$

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

$\int \frac{2}{x-1}dx = \int \frac{2}{u}du = 2\int \frac{1}{u}du$

$= 2\ln(x-1)$

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

Let $u = x+3$

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

$$\int \frac{-5}{x+3}\,dx = \int \frac{-5}{u}\,du = -5\int \frac{1}{u}\,du$$

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

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

$$= 2\ln(x-1) - 5\ln(x+3) + C,$$ where C is the constant of the integration.

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

x^2-2x-3

$x^2-3x+x-3 = x(x-3)+1(x-3)$

$= (x+1)(x-3)$ $[x+1=0,\ x=-1 \quad x-3=0,\ x=3]$

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

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

$f(x)$ where $x=3$

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

$12-16 = A(0) + B(4)$

$-4 = 4B$

$\therefore B = -1$

$f(x)$ where $x=-1$

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

$-4-16 = A(-4) + B(0)$

$-20 = -4A$

$\therefore A = 5$

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

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

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

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

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

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

$$\int \frac{-1}{x-3}\,dx$$

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

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

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

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

$= 5\ln(x+1) - 1\ln(x-3) + C$, where C is the constant of the integration.

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

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

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

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

$f(x)$ where $x = -1$

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

$-24 = A(-3)(2) + B(0)(2) + C(3)(0)$

$-24 = A(-6) + B(0) + C(0)$

$-24 = -6A$

$A = 4$

$f(x)$ where $x = 2$

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

$8 - 18 - 35 = A(0)(5) + B(3)(5) + C(3)(0)$

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

$-45 = 15B, \therefore B = -3$

$f(x)$ where $x = -3$

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

$10 = A(-5)(0) + B(-2)(0) + C(-2)(-5)$

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

$10 = 10C, \therefore C = 1$

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

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

$$\int \frac{4}{x+1}\,dx$$

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

$$\int \frac{4}{x+1}\,dx = \int \frac{4}{u}\,du = 4\int \frac{1}{u}\,du = 4\ln(x+1)$$

$$\int \frac{-3}{x-2}\,dx$$

Let $u = x-2$, $\frac{du}{dx} = 1$, $dx = du$

$$\int \frac{-3}{x-2}\,dx = \int \frac{-3}{u}\,du = -3\int \frac{1}{u}\,du$$

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

$$\int \frac{1}{x+3}\,dx$$

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

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

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

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

$$\int \frac{2x^2-9x-35}{(x+1)(x-2)(x+3)}\,dx = 4\ln(x+1) - 3\ln(x-2) + \ln(x+3) + C,$$ where C is the constant of the integration.