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Computer Engineering 19/ENG02/051
MAT 104

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

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

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

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

Let $x-1=0$; $x=1$

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

$$8 = 4A$$

$$A = 2$$

Let $x+3=0$; $x=-3$

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

$$20 = -4B$$

$$B = -5$$

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

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

$$= 2\log_e(x-1) - 5\log_e(x+3)$$

$= \log (x-1)^2 / (x+2)^3$

2) $2x^2 - 9x - 35 / (x+1)(x-2)(x+3)$

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

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

Let $x+1=0$; $x=-1$

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

$2+9-35 = -6A$

$11-35 = -6A$

$-26 = -6A$; $A = 26/6 \approx 13/3$

Let $x-2=0$; $x=2$

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

$8 - 18 - 35 = 15B$

$-45 = 15B$; $B = -3$

Let $x+3=0$; $x=-3$

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

$18 + 27 - 35 = 10C$

$10 = 10C$; $C = 1$

$\frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)} = \frac{25}{3}\frac{13}{(x+1)} - \frac{3}{(x-2)} + \frac{1}{(x+3)}$

$$= \int \frac{13}{3(x+1)} - \int \frac{3}{(x-2)} + \int \frac{1}{(x+3)} + C$$

$$= \frac{13}{3}\int \frac{1}{(x+1)} - 3\int \frac{1}{(x-2)} + \int \frac{1}{(x+3)}$$

$$= \frac{13}{3}\log_e(x+1) - 3\log_e(x-2) + \log_e(x+3)$$

$$= \log_e \frac{(x+1)^{13/3}(x+3)}{(x-2)^3} + C$$

3) $$\frac{1}{x^2+12x+1} = \int \frac{1}{(x+11)^2} = \int (x+11)^{-2}$$

$$= \frac{(x+11)^{-1}}{-1}$$

$$= \frac{-1}{(x+11)} + C$$