19/ENG05/054 MECHATRONICS ENGINEERING

OMOLUABI SEAN SEREMI

MAT 104

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

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

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

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

When $x=1$,

$11-3 = 4B$

$B = 8/4 = 2$

When $x=-3$

$11+9 = -4A$

$A = 20/-4 = -5$

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

$= -5\ln(x+3) + 2\ln(x-1) + C_1$

When $x=-2$,

$8+18-35 = -1B$

$B = 9$

When $x=-1$

$2+9-35 = 2A$

$A = -12$

When $x=-3$

$18+27-35 = 2C$

$C = 5$

$\int \frac{-12}{(x+1)} + \int \frac{9}{(x+2)} + \int \frac{5}{(x+3)}$

$-12\ln(x+1) + 9\ln(x+2) + 5\ln(x+3) + C_{11}$

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

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

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

(3) $\int \frac{1}{(x^2+121)}\,dx = \int \frac{1}{x^2+11^2}\,dx$

let $x = 11\tan\theta$

$x^2 = 11^2\tan^2\theta$

$\frac{dx}{d\theta} = 11\sec^2\theta$

$dx = 11\sec^2\theta\,d\theta$

$\int \frac{1}{(11^2\tan^2\theta+11^2)} \cdot 11\sec^2\theta\,d\theta$

$\int \frac{11\sec^2\theta\,d\theta}{11^2(1+\tan^2\theta)} = \int \frac{11\sec^2\theta\,d\theta}{121(\sec^2\theta)}$ (recall, $1+\tan^2\theta = \sec^2\theta$)

$\int \frac{11}{121}\,d\theta = \frac{11}{121}\theta + C_1$

$\theta = \tan^{-1}x/11$

$\therefore \frac{11}{11}\cdot\tan^{-1}(x/11) + C_1$