10/9/2005

Information for exam #1 in 421:01

Laplace transforms

Function	Laplace Transform
$f(t)$	$F(s) = \int_0^\infty e^{-st} f(t)\, dt$
$af(t) + bg(t)$	$aF(s) + bG(s)$
t^n (positive integer n)	$\frac{n!}{s^{n+1}}$
e^{at}	$\frac{1}{s-a}$
$\sin(kt)$	$\frac{k}{s^2+k^2}$
$\cos(kt)$	$\frac{s}{s^2+k^2}$
$e^{at} f(t)$	$F(s-a)$
$\mathcal{U}(t-a) f(t-a)$	$e^{-as} F(s)$
$g(t)\mathcal{U}(t-a)$	$e^{-as} \mathcal{L}\{g(t+a)\}$
$f'(t)$	$sF(s) - f(0^+)$
$f^{(n)}(t)$	$s^n F(s) - s^{n-1} f(0) - \ldots - f^{(n-1)}(0)$
$(f * g)(t) = \int_0^t f(t-\tau) g(\tau)\, d\tau$	$F(s)G(s)$
$\delta(t-a)$	e^{-as}
$\int_0^t f(w)\, dw$	$\frac{1}{s} F(s)$
$t^n f(t)$	$(-1)^n \frac{d^n}{ds^n} F(s)$
$f(t+T) = f(t)$ (periodic)	$\frac{1}{1-e^{-sT}} \int_0^T e^{-st} f(t)\, dt$

$$\sin(A+B) = \sin A \cos B + \cos A \sin B$$
$$\cos(A+B) = \cos A \cos B - \sin A \sin B$$

The other side presents some matrices in RREF.

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Some matrices and their reduced row echelon forms

ATLANTIC (3 by 5) $$\left(\begin{array}{cccc|c} 2 & 1 & -1 & 1 & P \\ -1 & 1 & 1 & 2 & Q \\ 1 & 1 & 3 & -2 & R \end{array}\right) \sim \left(\begin{array}{cccc|c} 1 & 0 & 0 & -1 & \frac{1}{5}P - \frac{2}{5}Q + \frac{1}{5}R \\ 0 & 1 & 0 & 2 & \frac{2}{5}P + \frac{7}{10}Q - \frac{1}{10}R \\ 0 & 0 & 1 & -1 & -\frac{1}{5}P - \frac{1}{10}Q + \frac{3}{10}R \end{array}\right)$$

PACIFIC (4 by 4) $$\left(\begin{array}{ccc|c} 2 & -1 & 1 & P \\ 1 & 1 & 1 & Q \\ -1 & 1 & 3 & R \\ 1 & 2 & -2 & S \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & 0 & 0 & \frac{1}{5}P + \frac{2}{5}Q - \frac{1}{5}R \\ 0 & 1 & 0 & -\frac{2}{5}P + \frac{7}{10}Q - \frac{1}{10}R \\ 0 & 0 & 1 & \frac{1}{5}P - \frac{1}{10}Q + \frac{3}{10}R \\ 0 & 0 & 0 & P - 2Q + R + S \end{array}\right)$$

The other side has some Laplace transform formulas.