Appendix A

Useful Formulæ for F1.8XD2

Standard Derivatives :

$F(x)$	$F'(x)$
x^n	nx^{n-1}
$\sin ax$	$a \cos ax$
$\cos ax$	$-a \sin ax$
$\tan ax$	$a \sec^2 ax$
e^{ax}	ae^{ax}
$\ln x$	$1/x$
$\cosh ax$	$a \sinh ax$
$\sinh ax$	$a \cosh ax$
$F(ax+b)$	$aF'(ax+b)$
$u(x)v(x)$	$u'v + uv'$
$\dfrac{u(x)}{v(x)}$	$\dfrac{vu' - uv'}{v^2}$
$u(v(x))$	$\dfrac{du}{dv}\dfrac{dv}{dx}$

Standard Integrals :

$f(x)$	$\int f(x)\,dx$
$x^n \ (n \neq -1)$	$x^{n+1}/(n+1)$
$\sin ax$	$-\dfrac{\cos ax}{a}$
$\cos ax$	$\dfrac{\sin ax}{a}$
$\tan x$	$-\ln \cos x$
$1/(1+x^2)$	$\tan^{-1} x$
$\ln x$	$x \ln x - x$
e^{ax}	e^{ax}/a
$1/x$	$\ln x$
$u(x)$	$\int u(x(y))\dfrac{dx}{dy}\,dy$

Integration by Parts :

$$\int_a^b u(x)\frac{dv}{dx}\,dx = [u(x)v(x)]_a^b - \int_a^b \frac{du}{dx}v(x)\,dx$$

Trigonometrical Formulæ :

$$\sin^2 A + \cos^2 A = 1\,, \qquad \sec^2 A = \tan^2 A + 1\,,$$

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

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

$$\sin 2A = 2 \sin A \cos A\,, \quad \cos 2A = 2\cos^2 A - 1 = 1 - 2\sin^2 A$$

$$\sin A \sin B = \frac{1}{2}(\cos(A-B) - \cos(A+B))$$

$$\cos A \cos B = \frac{1}{2}(\cos(A-B) + \cos(A+B))$$

$$\sin A \cos B = \frac{1}{2}(\sin(A+B) + \sin(A-B))$$

$$\sin A + \sin B = 2\sin\left(\frac{A+B}{2}\right)\cos\left(\frac{A-B}{2}\right)$$

$$\sin A - \sin B = 2\sin\left(\frac{A-B}{2}\right)\cos\left(\frac{A+B}{2}\right)$$

$$\cos A + \cos B = 2\cos\left(\frac{A+B}{2}\right)\cos\left(\frac{A-B}{2}\right)$$

$$\cos A - \cos B = -2\sin\left(\frac{A+B}{2}\right)\sin\left(\frac{A-B}{2}\right)$$

Laplace transforms :

$f(t)$	$F(s)$
c	c/s
t	$1/s^2$
t^n	$n!/s^{n+1}$
e^{kt}	$1/(s-k)$
$\sin at$	$a/(s^2+a^2)$
$\cos at$	$s/(s^2+a^2)$
$t\sin at$	$2as/(s^2+a^2)^2$
$t\cos at$	$(s^2-a^2)/(s^2+a^2)^2$
$af(t)+bg(t)$	$aF(s)+bG(s)$
$f'(t)$	$sF(s)-f(0)$
$f''(t)$	$s^2F(s)-sf(0)-f'(0)$
$\delta(t-a)$	e^{-as}
$e^{at}f(t)$	$F(s-a)$
$f(t)=\begin{cases} g(t-a) & t>a \\ 0 & t<a \end{cases}$	$e^{-as}G(s)$