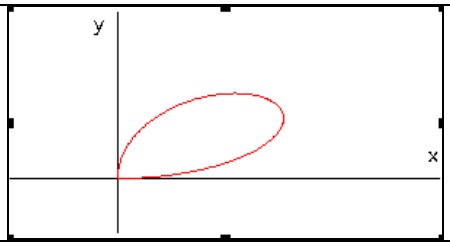
Jan/Mac 2006 Intake Paper 1 (FM1) [Examination date: 28 March 2007]

1.	SHOW
2.	$y = Ae^{5x} + Be^{-3x} + \frac{6}{13}\sin x - \frac{30}{13}\cos x$
3.	$16u^3 + 192u^2 + 720u + 719 = 0$
4.	i) $y = 3$, $x = -9$, $x = \frac{3}{2}$ (ii) $\left(12, \frac{62}{21}\right), \left(-2, \frac{18}{7}\right)$ (iii) $\left(0, \frac{22}{9}\right), \left(\frac{-7+\sqrt{93}}{2}, 0\right), \left(\frac{-7-\sqrt{93}}{2}, 0\right)$
5.	$I_n = \frac{1}{n}\cos^{n-1} x \sin x + \frac{n-1}{n} I_{n-2}$; $= \frac{1}{4}\cos^3 x \sin x + \frac{3}{8}\cos x \sin x + \frac{3}{8}x + C$
6.	PROVE
7.	$2e^{\frac{5\pi}{9}i}, 2e^{\frac{11\pi}{9}i}, 2e^{\frac{17\pi}{9}i}$; $24, \frac{5}{3}$
8.	ii) $173\frac{3}{5}\pi$
9.	i) $\frac{35\sqrt{6}}{18}$; (ii) $8\mathbf{i} + 2\mathbf{j} - 11\mathbf{k}$; (iii) $\frac{17\sqrt{21}}{63}$; (iv) 36.3°
10.	$\cos\frac{2\pi}{15}$, $\cos\frac{8\pi}{15}$, $\cos\frac{14\pi}{15}$, $\cos\frac{4\pi}{3}$, $\cos\frac{26\pi}{15}$
11E.	a) $\lambda_1 = 3, \mathbf{e}_1 = \begin{pmatrix} 2 \\ 1 \\ 2 \end{pmatrix}$; $\lambda_2 = 6, \mathbf{e}_2 = \begin{pmatrix} -2 \\ 2 \\ 1 \end{pmatrix}$; $\lambda_3 = -9, \mathbf{e}_3 = \begin{pmatrix} 1 \\ 2 \\ -2 \end{pmatrix}$; $\mathbf{P} = \begin{pmatrix} 2 & -2 & 1 \\ 1 & 2 & 2 \\ 2 & 1 & -2 \end{pmatrix}$; $\mathbf{D} = \begin{pmatrix} 27 & 0 & 0 \\ 0 & 216 & 0 \\ 0 & 0 & -729 \end{pmatrix}$ b) ii) $\left\{\begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix}, \begin{pmatrix} 2 \\ 4 \\ 3 \end{pmatrix}, \begin{pmatrix} 4 \\ 7 \\ 5 \end{pmatrix}\right\}$ (iii) $\left\{\begin{pmatrix} 1 \\ 1 \\ -3 \\ 1 \end{pmatrix}\right\}$
11O.	a) i)  (ii) $\frac{1}{8}\pi a^2$