Jan 2003 Intake Paper 1 (FM1) [Examination date: 25 March 2004]

1.	$\dfrac{1}{18} - \dfrac{1}{3(N+1)(N+2)(N+3)}$
2.	PROVE
3.	$\lambda_1 = -2$, $\mathbf{e}_1 = \begin{pmatrix} -17 \\ 6 \\ 7 \end{pmatrix}$; $\lambda_2 = 2$, $\mathbf{e}_2 = \begin{pmatrix} 1 \\ -2 \\ 1 \end{pmatrix}$; $\lambda_3 = 4$, $\mathbf{e}_3 = \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}$
4.	$\dfrac{1}{3}\sec^2 x \tan x + \dfrac{2}{3}\tan x + C$
5.	a) 3
6.	$\dfrac{1}{2}a^2$
7.	$k = 1, 2, 3, 4, 5$; $\dfrac{-1}{2}$, $\dfrac{-1}{2} \pm \dfrac{\sqrt{3}}{6}i$, $\dfrac{-1}{2} \pm \dfrac{\sqrt{3}}{2}i$
8.	i) $a = \dfrac{1}{2}$, $b = 1$; ii) $x = \dfrac{-3}{4} - \dfrac{1}{4}e^{-2t} + \dfrac{1}{2}t + e^{-t}$
9.	i) $5 + \dfrac{4}{x-2} - \dfrac{4}{x+3}$; ii) $y = \dfrac{9}{5}$; iii) $y = 5$, $x = 2$, $x = -3$; iv) $\dfrac{9}{5} < k \le 5$
10.	i) $\lambda a + \mu + t = 2$, $2\lambda + \mu - t = a - 2$, $\lambda + 2t = 1$; iii) $(2, 2, 3)$; iv) l lies in p
11E.	Rank $= 2$; $\left\{ \begin{pmatrix} -1 \\ -3 \\ 1 \\ 0 \end{pmatrix}, \begin{pmatrix} -8 \\ -5 \\ 0 \\ 1 \end{pmatrix} \right\}$; $p = -17$, $q = -18$
11O.	iii) $\dfrac{1}{2} \pm \dfrac{\sqrt{3}}{2}i$, $\dfrac{-3}{2} \pm \dfrac{\sqrt{5}}{2}$