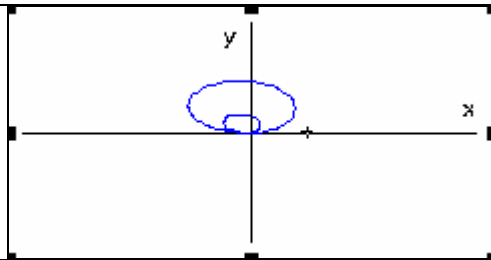


Jan 2004 Intake Paper 1 (FM1) [Examination date: 4 April 2005]

1.	SHOW
2.	$\frac{1}{x} - \frac{2}{x+1} + \frac{1}{x+2}$; $\frac{1}{4} - \frac{1}{2(N+1)(N+2)}$; $\frac{1}{4}$
3.	PROVE
4.	$\frac{61\sqrt{3}}{8} + \frac{5}{16} \ln(2+\sqrt{3})$
5.	i) $(1, -1, 2)$; ii) $\frac{\sqrt{14}}{2}$; iii) $\begin{pmatrix} 4 \\ 1 \\ -2 \end{pmatrix}$
6.	i) Rank = 2 ; ii) $\left\{ \begin{pmatrix} -1 \\ 2 \\ 0 \\ 1 \end{pmatrix}, \begin{pmatrix} 2 \\ 4 \\ 3 \\ 0 \end{pmatrix} \right\}$; iii) $\mathbf{X} = \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \end{pmatrix} + \lambda \begin{pmatrix} -1 \\ 2 \\ 0 \\ 1 \end{pmatrix} + \beta \begin{pmatrix} 2 \\ 4 \\ 3 \\ 0 \end{pmatrix}$
7.	i) $2p^2$; ii) $5pq$
8.	i) 4 ; ii) $\frac{32}{3}\pi$
9.	 $\frac{\pi^3}{2}$
10.	$\sin 5\theta = 16\sin^5 \theta - 20\sin^3 \theta + 5\sin \theta$; $\tan 5\theta = \frac{\tan^5 \theta - 10\tan^3 \theta + 5\tan \theta}{1 - 10\tan^2 \theta + 5\tan^4 \theta}$
11E.	$a = 2$, $b = 2$, $c = 1$; $\frac{e^{\pi-x}}{2\sqrt{x}} \left[(\pi-1)\cos x + \pi \sin x + \frac{1}{2}x - \frac{1}{2} \right]$
11O.	i) $\lambda_1 = \frac{1}{2}, \mathbf{e}_1 = \begin{pmatrix} 13 \\ 1 \\ 6 \end{pmatrix}$; $\lambda_2 = \frac{-1}{2}, \mathbf{e}_2 = \begin{pmatrix} 24 \\ -5 \\ 12 \end{pmatrix}$; $\lambda_3 = \frac{1}{3}, \mathbf{e}_3 = \begin{pmatrix} 2 \\ 0 \\ 1 \end{pmatrix}$ iii) $k + \frac{1}{2}q$; $k - \frac{1}{2}q$; $k + \frac{1}{3}q$