## Jan/Mac 2007 Intake Paper 1 (FM1) [Examination date: 27 March 2008]

1. 
$$2^{n} \cdot 3^{n+2} + 2 \cdot 5^{2n+1}$$
 is divisible by 19 for all positive integers  $n$ .

2.  $\frac{1}{2(r+1)} - \frac{1}{2(r+3)}$  ;  $\frac{5}{5} - \frac{1}{n+2} - \frac{1}{n+3}$ 

3.  $25u^3 - 111u^2 + 154u - 73 = 0$ 

4.  $\frac{8}{105}$ 

5.  $Ae^{-2x} + Be^{-3x} - \frac{1}{2}\cos x + \frac{5}{2}\sin x$ 

6.  $\pm \sqrt{2} \pm i\sqrt{2}$  ;  $(\sqrt{2} - 1)\pm i\sqrt{2}$   $5 - 2\sqrt{2}$  ,  $-(\sqrt{2} + 1)\pm i\sqrt{2}$   $5 + 2\sqrt{2}$ 

a)  $24x - 7y - 13z = 79$  ; (b)  $7x - 9y + 6z = -35$  ;

7. (c)  $\mathbf{r} = \begin{bmatrix} 0 \\ -\frac{19}{159} \\ -\frac{159}{159} \\ -\frac{9.56}{159} \end{bmatrix} + \lambda \begin{bmatrix} 159 \\ 235 \\ 167 \end{bmatrix}$  OR  $\mathbf{r} = \begin{bmatrix} \frac{218}{235} \\ 0 \\ -\frac{1393}{235} \\ 167 \end{bmatrix}$  OR  $\mathbf{r} = \begin{bmatrix} \frac{956}{167} \\ 1393 \\ 167 \\ 167 \end{bmatrix}$ 

a)  $(0, -1), (-0.62, 0)$  and  $(1.62, 0)$ 

b)  $y = 2$ 

c) Minimum  $(0, -1)$  and Maximum  $(-2, 5)$ 

9.  $\frac{6}{5}\pi a^2 \cdot \frac{15}{256}\pi a$ 

10.  $\begin{bmatrix} y & \frac{7}{4} & \frac{15}{2} & \frac{1}{2} &$