

**Sample Test 1**  
**Mathematics A2**  
March, 2011

1. Answer if the following numerical series converges or diverges:

$$\sum_{n=1}^{\infty} \frac{n^2 + 3}{n \cdot 2^n + 1}.$$

2. Expand the McLaurin series of the function  $f(x) = \ln(1 - 2x)$  and give the first four nonzero terms plus find all points of convergence.

3. Give the Fourier series of the periodic function  $f(x) = |2x|$ , if  $|x| \leq \pi$ ,  $f(x) = f(x + 2k\pi)$ .

4. Give the value of the parameter  $a$  such that the system have one unique solution:

$$x + y + az = 0$$

$$x + ay + z = 0$$

$$ax + y + z = 0$$

5. Give the value of the determinant:

$$\begin{vmatrix} 0 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 \end{vmatrix}$$