A) Select the correct answer

1) Only one of the following series diverges

$\sum \frac{(-1)^n}{n}$	$\sum \frac{4}{n^{\sqrt{8}}}$	$\sum \frac{4n}{n^6+1}$	$\sum \frac{4}{n^{1.4}}$	$\sum \frac{4}{\sqrt[5]{n}}$
Conv. By Alternate test	Conv. P-series p=$\sqrt{8} > 1$	Conv. Comparison test $b_n = \frac{4n}{n^6} = \frac{4}{n^5}$	Conv. P-series p=$1.4 > 1$	Diverge P-series p=$\frac{1}{5} \leq 1$

2) $\sum_0^\infty \frac{9}{4^n} = 9 + \frac{9}{4} + \frac{9}{16} + \frac{9}{64} + \cdots = \frac{a}{1-r} = \frac{9}{1-\frac{1}{4}} = 12$

Geometric series with $a = 9, r = \frac{1}{4}$

5	10	12	6

3) The sequence $\left\{\frac{4^n}{9^{n+1}}\right\}_{n=1}^{\infty}$

$\lim_{n\to\infty} \frac{4^n}{9^{n+1}} = \lim_{n\to\infty} \frac{4^n}{9^n * 9} = \lim_{n\to\infty} \left(\frac{4}{9}\right)^n * \frac{1}{9} = 0$ since $\lim_{n\to\infty} a^n = \begin{cases} 0 & 0 < a < 1 \\ \infty & a > 1 \end{cases}$

a) Diverge b) converge to 5 <u>c) converge to 0</u> d) converge to 1

4) The sequence $\left\{\frac{7^n}{3^{n+1}}\right\}_{n=1}^{\infty}$

$\lim_{n\to\infty} \frac{7^n}{3^{n+1}} = \lim_{n\to\infty} \frac{7^n}{3^n * 3} = \lim_{n\to\infty} \left(\frac{7}{3}\right)^n * \frac{1}{3} = \infty$

a) Converge to 0 b) converge to 2 <u>c) Diverge</u> d) converge to 3

B) Test the convergence of the following

1) $\sum_0^\infty \frac{5^n n^2}{(n)!}$

$$\lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| = \lim_{n\to\infty} \frac{5^{n+1}(n+1)^2}{(n+1)!} * \frac{(n)!}{5^n n^2} =$$

$$\lim_{n\to\infty} \frac{5^n * 5(n+1)^2}{(n+1)(n)!} * \frac{(n)!}{5^n n^2} = \lim_{n\to\infty} \frac{5(n+1)}{n^2} = \lim_{n\to\infty} \frac{5n}{n^2} = \lim_{n\to\infty} \frac{5}{n} = 0 \quad < 1$$

Abs. Converge by Ratio test

2) $\sum_{\mathbf{1}}^{\infty} \frac{(\mathbf{2n+3})^{\boldsymbol{n}}}{\boldsymbol{n}^{\boldsymbol{n}}}$

$$\lim_{n\to\infty} \sqrt[n]{|a_n|} = \lim_{n\to\infty} \sqrt[n]{\frac{(\mathbf{2n+3})^{\boldsymbol{n}}}{\boldsymbol{n}^{\boldsymbol{n}}}} = \lim_{n\to\infty} \frac{2n+3}{n} = 2 \quad > 1$$

Diverge by root test

3) $\sum_{\mathbf{1}}^{\infty} \frac{(\mathbf{4n+2})^{\boldsymbol{n}}}{\boldsymbol{n}^{\mathbf{3}\boldsymbol{n}}}$

$$\lim_{n\to\infty} \sqrt[n]{|a_n|} = \lim_{n\to\infty} \sqrt[n]{\frac{(\mathbf{4n+2})^{\boldsymbol{n}}}{\boldsymbol{n}^{\mathbf{3}\boldsymbol{n}}}} = \lim_{n\to\infty} \frac{4n+2}{n^3} = 0 \quad < 1$$

Abs. Converge by Root tset