

## Quiz 12

This quiz is graded out of 10 marks. No books, calculators, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

**Question 1.** (5 marks) §8.3 #19 Determine whether the series is convergent or divergent.

$$\sum_{n=1}^{\infty} \underbrace{\frac{n-1}{n4^n}}_{a_n} \quad \text{So} \quad a_n = \frac{n-1}{n4^n} \leq \frac{n}{n4^n} = \frac{1}{4^n} = \left(\frac{1}{4}\right)^n = b_n$$

$\sum b_n$  where  $b_n = \left(\frac{1}{4}\right)^n$  is a geometric series where  $|r| = \frac{1}{4} < 1 \therefore$  converges.

$\therefore \sum a_n$  converges by comparison test.

**Question 2.** (5 marks) §8.4 #21 Determine whether the series is convergent or divergent.

$$\sum_{n=0}^{\infty} \underbrace{\frac{(-10)^n}{n!}}_{a_n}$$

$$\lim_{n \rightarrow \infty} \left| \frac{a_{n+1}}{a_n} \right|$$

$$= \lim_{n \rightarrow \infty} \left| \frac{\frac{(-10)^{n+1}}{(n+1)!}}{\frac{(-10)^n}{n!}} \right|$$

$$= \lim_{n \rightarrow \infty} \left| \frac{(-10)^{n+1}}{(n+1)!} \cdot \frac{n!}{(-10)^n} \right|$$

$$= \lim_{n \rightarrow \infty} \left| \frac{(-10)^n (-10) n!}{(n+1)n! (-10)^n} \right|$$

$$\begin{aligned} &= \lim_{n \rightarrow \infty} \left| \frac{-10}{n+1} \right| \\ &= 0 < 1 \end{aligned}$$

$\therefore \sum a_n$  is absolutely convergent by ratio test.