## Department of Mathematics, Bennett University Engineering Calculus (EMAT101L) Tutorial Sheet 3

1. Determine which of the following series converges/diverges:

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

$$(a) \sum_{n=1}^{\infty} \frac{4}{n^2 + 3n + 2} \qquad (b) \sum_{n=1}^{\infty} \left(\sin^2 \frac{1}{n} - \sin^2 \frac{1}{n+2}\right).$$

2. Determine which of the following series converges/diverges:

(a) 
$$\sum_{n=1}^{\infty} 5^{\frac{1}{n}}$$
 (b)  $\sum_{n=1}^{\infty} (1 + \frac{x}{n})^n$ 

$$(c) \sum_{n=1}^{\infty} \log \left( \frac{n+1}{n} \right)$$

(d) 
$$\sum_{n=1}^{\infty} (a + (n-1)b)$$

(a)  $\sum_{n=1}^{\infty} 5^{\frac{1}{n}}$  (b)  $\sum_{n=1}^{\infty} \left(1 + \frac{x}{n}\right)^n$  (c)  $\sum_{n=1}^{\infty} \log\left(\frac{n+1}{n}\right)$  (d)  $\sum_{n=1}^{\infty} (a + (n-1)b)$  (e)  $\sum_{n=1}^{\infty} a_n x^n$ , where  $0 \le a_n \le 1$   $(n \ge 0)$  and if  $0 \le x < 1$ .

3. Determine which of the following series converges/diverges:

$$(a) \sum_{n=1}^{\infty} \frac{\log n}{n^{3/2}}$$

$$\sum_{n=1}^{\infty} \frac{1}{n \sqrt[n]{n}}$$

$$(c) \sum_{n=1}^{\infty} \frac{\sqrt[n]{n}}{n^2}$$

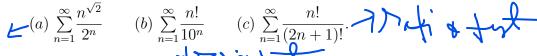
$$(d)\sum_{n=0}^{\infty}\sin\left(\frac{\pi}{2^n}\right)$$

$$(e) \sum_{n=1}^{\infty} \frac{1}{n} \sin\left(\frac{1}{\sqrt{n}}\right)$$

4. Determine which of the following series converges/diverges:  $(a) \sum_{n=1}^{\infty} \frac{\log n}{n^{3/2}} \qquad (b) \sum_{n=1}^{\infty} \frac{1}{n} \sqrt[n]{n} \qquad (c) \sum_{n=1}^{\infty} \frac{\sqrt[n]{n}}{n^2} \qquad (d) \sum_{n=0}^{\infty} \sin\left(\frac{\pi}{2^n}\right) \qquad (e) \sum_{n=1}^{\infty} \frac{1}{n} \sin\left(\frac{1}{\sqrt{n}}\right).$ 

$$(a) \sum_{n=1}^{\infty} \frac{n^{\sqrt{2}}}{2^n}$$

$$(b) \sum_{n=1}^{\infty} \frac{n!}{10^n}$$



5. Determine which of the following series converges absolutely/conditionally:

$$(a) \sum_{n=1}^{\infty} (-1)^n \frac{1}{n}$$

(a) 
$$\sum_{n=1}^{\infty} (-1)^n \frac{1}{n}$$
 (b)  $\sum_{n=1}^{\infty} (-1)^n \frac{\sin nx}{n^2}$  (c)  $\sum_{n=2}^{\infty} (-1)^n \frac{1}{\log n}$ .

$$(c) \sum_{n=2}^{\infty} (-1)^n \frac{1}{\log n}.$$

6. Find the value of x for which the following series converges:

(a) 
$$\sum_{n=0}^{\infty} (n+1+2^n)x^n$$

$$(b) \sum_{n=0}^{\infty} \frac{n! x^n}{n^n}$$

(a) 
$$\sum_{n=0}^{\infty} (n+1+2^n)x^n$$
 (b)  $\sum_{n=0}^{\infty} \frac{n!x^n}{n^n}$  (c)  $\sum_{n=1}^{\infty} \frac{n^{n^2}}{(n+1)^{n^2}}(x-1)^n$ .