1. (10 points) Determine whether the following sequences converge or diverge. If they converge, find their limit. If they diverge, state whether they diverge to $+\infty$, $-\infty$ or because they oscillate. **Justify and show all your work.**

(a)

$$a_n = \left(1 + \frac{1}{2n}\right)^n$$

ANSWER:

(b)

$$a_n = \frac{2^n}{n3^n}$$

ANSWER:

2. (10 points) Determine whether the following sequences converge or diverge. If they converge, find their limit. If they diverge, state whether they diverge to $+\infty$, $-\infty$ or because they oscillate. **Justify and show all your work.**

(a)

$$a_n = \cos\left(\frac{\ln(n)}{n}\right)$$

ANSWER:

(b)

$$a_n = \frac{2^n}{n^n}$$

ANSWER:

3. (10 points) Determine whether the following series converges or diverges. If it converges, find its sum. **Justify and show all your work. Name any test you are using.**

$$\sum_{n=1}^{\infty} \frac{7^{2n}}{24^{n+1}}$$

ANSWER:

4. (10 points) Determine whether the following series converges or diverges. If it converges, find its sum. **Justify and show all your work. Name any test you are using.**

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

ANSWER:

5. (10 points) Determine whether the following series converges or diverges. **Justify and show all your work. Name any test you are using.**

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

ANSWER:

6. (10 points) Determine whether the following series converge or diverge. **Justify and show all your work. Name any test you are using.**

$$\sum_{n=1}^{\infty} \frac{\arctan(n)}{n^{1.2} - 6}$$

ANSWER:

7. (10 points) Determine whether the following series converge or diverge. **Justify and show all your work. Name any test you are using.**

$$\sum_{n=1}^{\infty} \frac{\sqrt{n}}{n^3 + 5n}$$

ANSWER:

8. (10 points) Determine whether the following series converge or diverge. **Justify and show all your work. Name any test you are using.**

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

ANSWER:

9. (10 points) Use the integral test to determine whether the following series converges or diverges. **To get full credit you must use the integral test.**

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

ANSWER:

10. (10 points) Consider the alternating series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^4}$.

(a) Use the Alternating Series Test to show the series converges.

ANSWER:

(b) How many terms does it require to approximate the sum with error $\leq .001$?

ANSWER:

(c) Approximate the sum of the series to within in .001. (Write it as a single fraction.)

ANSWER: