1. (a) Find the following limit

$$\lim_{n\to\infty}(1+\frac{1}{n})^{2n}$$

(b) Is the sequence $\{(-1)^n\}_{n\geq 0}$ convergent? Explain.

2. Determine whether the following series converge or diverge. Make sure to verify the hypothesis of any test you are using.
(a)

$$\sum_{n=2}^{\infty}\frac{5n+19}{n^2+7n+10}$$

(b)

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

3. Find the sums of the series
(a)

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

(b)

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

4. What does is mean for the infinite series

$$\sum_{n=1}^{\infty}a_n$$

to converge to a number L?

5. Is the following series absolutely convergent, conditionally convergent or divergent?

$$\sum_{n=2}^{\infty}\frac{(-1)^n\arctan n}{n^2+1}$$

ANSWERS:

1. (a) e^2 (b) divergent

2. a) divergent (limit comparison test) , b) convergent (ratio test)

3. (a) 1/3, (b) 1/72

4. Let $S_n = a_1 + a_2 + ... + a_n$. The series converges to L if and only if $\lim_{n\to\infty} S_n = L$.

5. Absolutely convergent (direct comparison test)