Directions: For each series, determine if the sum converges or diverges. (Note: this portion of the worksheet covers Alternating Series Test, Absolute Convergence Test, Ratio Test, and Root Test. You can use any tests you know, but the worksheet is designed to help you with these four.)

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

2.
$$\sum_{n=1}^{\infty} \left(1 + \frac{4}{n}\right)^{n}$$

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

4.
$$\sum_{n=2}^{\infty} \frac{n}{(\ln n)^{n}}$$

5.
$$\sum_{n=2}^{\infty} \frac{n}{(\ln n)^{n/2}}$$

6.
$$\sum_{n=1}^{\infty} \frac{e^n n^\pi}{\pi^n n^e}$$

7.
$$\sum_{n=1}^{\infty} \frac{n^2 \ln n}{3^n}$$

(hint: if you can show $\sum n^3/3^n$ converges, you can use comparison test with that.)

8.
$$\sum_{n=1}^{\infty} \left(\frac{n-2}{n}\right)^n$$

Directions: For each series, determine whether the series is absolutely convergent, conditionally convergent, or divergent. Show all work, including the test(s) you are using, and justifying the conditions of the test(s) are met.

1.

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

2.

$$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{3+n}{5+n}$$

3.

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

4.

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