Answer each of the following questions. Show all work, as partial credit may be given.

1. (8 pts. each) If it converges, find the sum of each of the following series. If the series diverges, explain why it diverges.

(a) \( \sum_{n=0}^{\infty} (-1)^n \frac{2^{n+1}}{3^n} \)

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

(c) \( \sum_{n=1}^{\infty} \frac{1}{\sqrt{n+2}} - \frac{1}{\sqrt{n+1}} \)

2. (10 pts. each) Use the Integral Test to determine whether each of the following series converges or diverges.

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

(b) \( \sum_{n=1}^{\infty} \frac{1}{2n + 1} \)

3. (10 pts. each) Use an appropriate comparison test to determine if each of the following series converge or diverge.

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

(b) \( \sum_{n=2}^{\infty} \frac{(\ln(n))^2}{n^{1/3}} \)

4. (10 pts. each) Use the Ratio Test or Root Test to determine if each of the following series converge or diverge.

(a) \( \sum_{n=1}^{\infty} \frac{n^{10}}{10^n} \)

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

5. (10 pts. each) Determine whether each of the following series diverge, converge conditionally, or converge absolutely. Justify your answer by applying an appropriate convergence test.

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

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