This worksheet (mainly) contains problems using the ratio and root tests. You will want to do as many problems from this section as you can.

1. \[ \sum_{n=1}^{\infty} \frac{(-1)^n}{(2 - \frac{1}{n})^n}. \]

2. \[ \sum_{n=1}^{\infty} \frac{4^n}{3^n + 2^n}. \]

3. \[ \sum_{n=1}^{\infty} \left(1 - \frac{1}{n}\right)^{n^2} \]

4. \[ \sum_{n=1}^{\infty} \frac{2^n - n^6}{n \, 2^n}. \]
For 5 and 6, classify the series as absolutely convergent, conditionally convergent, or divergent. Be sure to state which tests you use and show all your work.

5. $\sum_{n=1}^{\infty} \frac{(-2)^{2n}}{n^n}$ (Hint: since everything is an $n$th power, the root test will work.)

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

7. Around 1910, the Indian mathematician Ramanujan discovered the formula

$$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{n=0}^{\infty} \frac{(4n)!(1103 + 26390n)}{(n!)^4 396^{4n}}.$$

William Gosper in 1985 used this series to compute $\pi$ to 17 million digits.

(a) Verify that the series is convergent.

(b) How many correct decimal places of $\pi$ do you get if you use just the first term of the series? What about if you use the first 2 terms?