Write your name on the appropriate line on the exam cover sheet. This exam contains 9 pages (including this cover page) and 8 questions. Check that you have every page of the exam. Answer the questions in the spaces provided on the question sheets. Be sure to answer every part of each question and show all your work. If you run out of room for an answer, continue on the back of the page — being sure to indicate the problem number.

Question	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
Total:	80	

1. (10 points) Determine if the following series converge or diverge. If the series converges, find the sum. If the series diverges, prove it.

$$\sum_{n=0}^{\infty} 7 \left(\frac{\pi}{2}\right)^n$$

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

2. (10 points) Determine if the following series converges or diverges. Be sure to justify your answer completely.

$$\sum_{n=1}^{\infty} \left(\frac{6n - 1}{5n + 3} \right)^n$$

3. (10 points) Determine if the following series converge or diverge. Be sure to justify your answer completely.

$$\sum_{n=0}^{\infty} \sin\left(\frac{\pi n}{6n+1}\right)$$

$$\sum_{n=1}^{\infty} \sin\left(\frac{1}{\sqrt{n}}\right)$$

4. (10 points) Determine if the following series converges or diverges. If the series converges, find the sum. If the series diverges, prove it. [Hint: $\frac{2}{(n-1)(n+1)} = \frac{1}{n-1} - \frac{1}{n+1}$.]

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

5. (10 points) Determine if the following series converge or diverge. Be sure to justify your answers completely.

$$\sum_{n=1}^{\infty} \frac{n^3 + 2n - 1}{n^5 + 4}$$

$$\sum_{n=1}^{\infty} \frac{n^2 + 3}{\sqrt{2n^5 - 1}}$$

6. (10 points) Determine if the following series is divergent, conditionally convergent, or absolutely convergent. Be sure to justify your answer completely.

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

7. (10 points) Determine if the following series converges or diverges. Be sure to justify your answer completely.

$$\sum_{n=0}^{\infty} \frac{(n!)^3}{(3n)!}$$

8. (10 points) Find the center, radius of convergence, and interval of convergence for the following power series:

$$\sum_{n=0}^{\infty}(-1)^n \frac{(x+3)^n}{n\,3^n}$$