Math 141
Summer 2016 Name:
Exam 3

1. $\boxed{\text{5 pts. each}}$ Consider the sequence $\left(-\frac{1}{2}, \frac{1}{3}, -\frac{1}{4}, \frac{1}{5}, -\frac{1}{6}, \ldots\right)$.

   (a) Find a recurrence relation that generates the sequence.

   (b) Find an explicit formula for the nth term of the sequence.

2. $\boxed{\text{10 pts. each}}$ Find the limit of the sequence, or determine that it does not exist.

   (a) $a_n = \sqrt{\dfrac{2n}{n+1}}$

   (b) $a_n = \ln\left(\dfrac{3n+1}{3n-1}\right)^n$

3. $\boxed{\text{10 pts.}}$ Write the repeating decimal $1.7\overline{25}$ first as a geometric series, and then evaluate the series as a fraction (i.e. a ratio of integers).

4. $\boxed{\text{10 pts.}}$ Let p be a positive integer. For the telescoping series

$$\sum_{k=1}^{\infty} \frac{1}{(k+p)(k+p+2)},$$

find a formula for the nth term of the sequence of partial sums (s_n), and then evaluate $\lim_{n\to\infty} s_n$ to obtain the value of the series.

5. $\boxed{\text{10 pts.}}$ Determine whether the series

$$\sum_{n=0}^{\infty} \frac{10}{n^2+9}$$

converges or diverges using either the Divergence Test or Integral Test.

6. $\boxed{\text{10 pts.}}$ Use either the Direct Comparison Test or Limit Comparison Test to determine whether

$$\sum_{n=1}^{\infty} \frac{1}{2n - \sqrt[3]{n^2}}$$

converges or diverges.

7. $\boxed{\text{10 pts.}}$ Use the Ratio Test to determine whether

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

converges or diverges.

8. $\boxed{\text{10 pts.}}$ Choose an appropriate test to determine whether

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

converges or diverges.

9. $\boxed{\text{10 pts.}}$ Use the Alternating Series Test to show the series

$$\sum_{n=0}^{\infty} (-1)^n \frac{n-1}{4n^2+9}$$

converges, or use another test to show it diverges.