MATH 141
SPRING 2017 NAME:
EXAM 3

1. $\boxed{\text{5 pts. each}}$ Consider the sequence $(6, 9, 12, 15, \ldots)$.

   (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) $a_n = \dfrac{\tan^{-1} n}{n}$

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

3. $\boxed{\text{10 pts.}}$ Write the repeating decimal $0.2\overline{13}$ as a geometric series.

4. $\boxed{\text{10 pts.}}$ For the telescoping series

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

find a formula for the kth term of the sequence of partial sums (s_k), and then evaluate 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. $\boxed{\text{10 pts.}}$ Choose an appropriate test to determine whether the series

$$\frac{1}{1\cdot 3}+\frac{1}{3\cdot 5}+\frac{1}{5\cdot 7}+\frac{1}{7\cdot 9}+\cdots$$

converges or diverges.

10. $\boxed{\text{10 pts.}}$ 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.