

## Math 141 Tutorial 10

### Main problems

1. Determine whether the following sequences  $\{a_n\}_{n=1}^{\infty}$  converge/diverge and justify your answer.

(a)  $a_n = \frac{\ln n}{n}$

(d)  $a_n = 2^{-n} \cos(n\pi)$

(b)  $a_n = \frac{n^2}{\sqrt{n^3+4n}}$

(e)  $a_n = \left(1 + \frac{1}{n}\right)^n$

(c)  $a_n = \sin(n\pi)$

(f)  $a_n = \sqrt{n} - \sqrt{n+1}\sqrt{n+3}$

2. Compute the limit of the following recursively defined sequences

(a)  $a_{n+1} = \frac{1}{2}(a_n + 6)$ ,  $a_0 = 2$     (b)  $a_{n+1} = \frac{a_n}{1+a_n}$ ,  $a_0 = 1$     (c)  $a_{n+1} = \sqrt{2a_n - 1}$ ,  $a_0 = 1$

3. Determine whether the following sequence converges:

$$a_n = \frac{1}{n^3} \cos(2n).$$

4. Compute the value of the following series:

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

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

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

(b)  $\sum_{n=1}^{\infty} 2^n e^{-n}$

(d)  $\sum_{n=1}^{\infty} \frac{3^{n+1}}{2^{2n+2}}$

(f)  $\sum_{n=1}^{\infty} \frac{1+3^n}{4^n}$