Name: due October 28 by 3:00 pm Pacific

Math 126 **Homework Assignment 23** **Fall 2020**

1. Use the Comparison Test to determine whether or not the series $\sum_{k=1}^{\infty} \frac{7}{2k+3\sqrt{k}}$ converges.

like $\sum_{k=1}^{\infty} \frac{1}{k}$ so D

need > D

We first note that

$$\frac{7}{2k+3\sqrt{k}} \geq \frac{7}{2k+3k} = \frac{7}{5k} > \frac{1}{k}$$

harmonic series

for all positive integers k. Since the series $\sum_{k=1}^{\infty} \frac{1}{k}$ diverges, the series $\sum_{k=1}^{\infty} \frac{7}{2k+3\sqrt{k}}$ diverges by the Comparison Test.

2. Use the Limit Comparison Test to determine whether or not the series $\sum_{k=1}^{\infty} \frac{k^2+5}{3k^4+2k^3-4}$ converges.

p-series, $p > 1$

The series $\sum_{k=1}^{\infty} \frac{1}{k^2}$ converges and

$$\alpha = \lim_{k\to\infty} \frac{\frac{k^2+5}{3k^4+2k^3-4}}{1/k^2} = \lim_{k\to\infty} \frac{k^4+5k^2}{3k^4+2k^3-4} = \frac{1}{3} < \infty.$$

since C

need $0 \leq \alpha < \infty$

Therefore, the series $\sum_{k=1}^{\infty} \frac{k^2+5}{3k^4+2k^3-4}$ converges by the Limit Comparison Test.

3. Determine (with proof) whether or not the series $\sum_{k=1}^{\infty} \frac{k-4}{k^2-3k+7}$ converges.

like $\sum_{k=1}^{\infty} \frac{1}{k}$

$p=1$ so diverges

The series $\sum_{k=1}^{\infty} \frac{1}{k}$ diverges and

since D need $0<\alpha\le\infty$

$$\alpha = \lim_{k\to\infty} \frac{\frac{k-4}{k^2-3k+7}}{1/k} = \lim_{k\to\infty} \frac{k^2-4k}{k^2-3k+7} = 1 > 0.$$

Hence, the series $\sum_{k=1}^{\infty} \frac{k-4}{k^2-3k+7}$ diverges by the Limit Comparison Test.

4. Determine (with proof) whether or not the series $\sum_{k=1}^{\infty} \frac{4^k}{2k+5^k}$ converges.

5^k overwhelms $2k$

We note that

$$\frac{4^k}{2k+5^k} < \frac{4^k}{5^k} = \left(\frac{4}{5}\right)^k$$

for all positive integers k. Since $\sum_{k=1}^{\infty} \left(\frac{4}{5}\right)^k$ is a convergent geometric series, the series $\sum_{k=1}^{\infty} \frac{4^k}{2k+5^k}$ converges by the Comparison Test.