Math 101 – WORKSHEET 24
SERIES

1. Review: Geometric and telescoping series

(1) Decide whether the following series converge or diverge

   (a) $\sum_{n=5}^{\infty} \frac{\pi^{2n+3}}{9^{n-2}}$

   (b) $\sum_{n=5}^{\infty} \frac{e^{2n+2}}{9^{n-2}}$

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

2. Skill 1: elements of a convergent series

(2) Show the following series diverge

   (a) $\sum_{n=1}^{\infty} (-1)^n$

   (b) $\sum_{n=0}^{\infty} n^2 \sin(n)$

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

3. Review of improper integrals

(3) Show the following series divergeShow that $\int_2^\infty \frac{dx}{x}$ diverges.

(3) Show that $\int_2^\infty \frac{dx}{x^3+5}$ converges.

(4) Evaluate $\int_0^\infty x e^{-x}\, dx$.

4. Skill 2: The Integral test

(6) Decide whether the following series converge or diverge.
   (a) $\sum_{n=1}^\infty \frac{1}{n}$
   (b) $\sum_{n=1}^\infty \frac{1}{n^p}$ (your answer will depend on p).