Math 109 HW8

Fall 2018

1. Use the comparison test to determine whether the integral

$$\int_0^{\pi/2} \frac{\sin^2 x}{x^{\frac{1}{4}}} dx$$

is convergent or divergent.

2. Determine whether each integral is convergent or divergent.

a) $\int_2^3 \frac{1}{x^2-x-2} dx$.

b) $\int_1^\infty \frac{1}{x^2-4x+4} dx$.

c) $\int_0^4 \frac{1}{\sqrt[3]{x-1}} dx$.

3. Find a formula for the general term a_n of the sequence $\{2, -4, 6, -8, 10, \cdots\}$, assuming that the pattern of the first few terms continues.

4. Find a formula for the general term a_n of the sequence $\{4, -1, \frac{1}{4}, -\frac{1}{16}, \frac{1}{64}, \cdots\}$, assuming that the pattern of the first few terms continues.

5. Write down an inductive formula for the general term a_n of the sequence $\{1, 3, 4, 7, 11, 18, 29, \cdots\}$, assuming that the pattern of the first few terms continues.

6. Determine if the sequence $\{a_n\}_{n=1}^\infty$ converges or diverges. If it converges, find the limit.

(a) $a_n = \frac{n^3}{2n^3-n}$.

(b) $a_1 = 4, a_{n+1} = a_n + 3$ for $n \geq 2$.

(c) $a_n = \sqrt[n]{e^{3n+4}}$.

7. Determine if the sequence $\{a_n\}_{n=1}^\infty$ converges or diverges. If it converges, find the limit.

(a) $a_n = \frac{\tan^{-1} n}{n}$.

(b) $a_n = \frac{\sin \frac{n}{2}}{n}$.

(c) $a_n = \sqrt[3]{\frac{(2n-1)!}{(2n+1)!}}$. Recall the factorial of a positive integer k is defined as $k! = k \cdot (k-1) \cdot (k-2) \cdots 1$.