

Homework 18 – Sequences

1) Match each sequence with its general term:

$a_1, a_2, a_3, a_4, \dots$	General term
a) $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \dots$	i) $\cos \pi n$
(b) $-1, 1, -1, 1, \dots$	ii) $\frac{n!}{2^n}$
(c) $1, -1, 1, -1, \dots$	iii) $(-1)^{n+1}$
(d) $\frac{1}{2}, \frac{2}{4}, \frac{6}{8}, \frac{24}{16}, \dots$	iv) $\frac{n}{n+1}$

2) Calculate the first four terms of each sequence, starting with $n = 1$.

a) $c_n = \frac{3^n}{n!}$

b) $b_n = 5 + \cos \pi n$

c) $a_n = \frac{(2n-1)!}{n!}$

3) Find a formula for the n th term of each sequence.

a) $\frac{1}{1}, \frac{-1}{8}, \frac{1}{27}, \dots$

b) $\frac{2}{6}, \frac{3}{7}, \frac{4}{8}, \dots$

4) Determine the limit of the sequence and state whether the sequence converges or diverges.

a) $b_n = \frac{5n-1}{12n+9}$

b) $c_n = -2^{-n}$

c) $\sqrt{4 + \frac{1}{n}}$

d) $a_n = \cos^{-1}\left(\frac{n^3}{n^3+1}\right)$

e) $a_n = 10 + \left(-\frac{1}{9}\right)^n$

f) $c_n = 1.01^n$

g) $a_n = 2^{\frac{1}{n}}$

h) $c_n = \frac{n!}{9^n}$

i) $a_n = \frac{3n^2 + n + 2}{2n^2 - 3}$

j) $a_n = \frac{\cos n}{n}$

k) $d_n = \ln 5^n - \ln n!$

l) $a_n = \left(2 + \frac{4}{n^2}\right)^{\frac{1}{3}}$

m) $c_n = \ln\left(\frac{2n+1}{3n+4}\right)$

n) $y_n = \frac{e^n}{2^n}$

o) $y_n = \frac{e^n + (-8)^n}{5^n}$

p) $a_n = n \sin \frac{\pi}{n}$

q) $b_n = \frac{3 - 4^n}{2 + 7 \cdot 4^n}$

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

s) $a_n = \frac{(\ln n)^2}{n}$