

## Assignment 10-1

Without using a calculator, write the first five terms of the sequence with the given  $n$ th term. Assume  $n = 1, 2, 3, \dots$

1.  $a_n = \frac{2^n}{n!}$                       2.  $a_n = \left(-\frac{1}{3}\right)^n$                       3.  $a_n = \cos\left(\frac{n\pi}{2}\right)$

Write the first five terms of the recursive sequence.

4.  $a_1 = 2, a_{n+1} = 3(a_n + 2)$                       5.  $a_1 = 0, a_{n+1} = \frac{\pi}{2}\left(\sin\left(a_n + \frac{\pi}{2}\right)\right)$

Write a recursive definition of the sequence.

6. 4, 7, 10, 13, ...                      7. 5, 10, 20, 40, ...                      8. 5,  $-\frac{5}{2}$ ,  $\frac{5}{4}$ ,  $-\frac{5}{8}$ , ...

Simplify without using a calculator.

9.  $\frac{7!}{10!}$                       10.  $\frac{(2n+1)!}{(2n-1)!}$

Find the limit of each sequence or state that the sequence diverges.

11.  $a_n = \frac{n^2}{3n^2 - 5}$                       12.  $a_n = \frac{\ln n^2}{3n}$                       13.  $a_n = \cos \frac{1}{n}$                       14.  $a_n = (-1)^n \frac{n^2}{n^2 + 2}$   
15.  $a_n = \frac{3n}{\sqrt{n^2 - 5}}$                       16.  $a_n = \frac{\cos n}{n}$                       17.  $a_n = (-1)^n \frac{n}{n^2 + 2}$                       18.  $a_n = \frac{(n+1)!}{n!}$

Write an expression for the  $n$ th term of each sequence. Assume  $n = 1, 2, 3, \dots$

19.  $-1, \frac{1}{4}, -\frac{1}{9}, \frac{1}{16}, \dots$                       20.  $\frac{3}{2}, \frac{4}{3}, \frac{5}{4}, \frac{6}{5}, \dots$                       21.  $\frac{2}{1}, \frac{4}{3}, \frac{8}{7}, \frac{16}{15}, \dots$                       22.  $\frac{3}{1}, \frac{3}{2}, \frac{3}{6}, \frac{3}{24}, \dots$   
23.  $\frac{1}{2}, \frac{x}{6}, \frac{x^2}{24}, \frac{x^3}{120}, \dots$                       24.  $-1, 1, 3, 5, \dots$                       25.  $\frac{1}{1}, \frac{4}{3}, \frac{9}{9}, \frac{16}{27}, \dots$

Determine whether each sequence with the given  $n$ th term is monotonic and/or bounded.

26.  $a_n = (-1)^n \frac{1}{n^2}$                       27.  $a_n = \frac{n^3 \cos(n\pi)}{n^2 + 1}$                       28.  $a_n = \left(\frac{1}{2}\right)^n$                       29.  $a_n = \left(\frac{3}{2}\right)^n$

Integrate:

30.  $\int_0^\infty e^{-x} dx$                       31.  $\int_0^6 \frac{4}{\sqrt{6-x}} dx$                       32.  $\int_0^\infty \frac{e^x}{1+e^x} dx$

33. Find  $g(x)$ , given that:  $g''(x) = 2x - 3$ ,  $g'(0) = -5$ , and  $g(-1) = 2$ .

34. The acceleration of an object moving along a horizontal path is given by the equation  $a(t) = 6t - 4$ . The object's initial velocity is 5, and its initial position is -2.

- Find a velocity equation for the object.
- Find the velocity of the object when  $t = 2$ .
- Find a position equation for the object.
- Find the object's position when  $t = 2$ .