MATH 230
11.1

Directions: Show all work on a separate sheet of paper for full credit.

1. List the first five terms of the sequence.

   a) $a_n = \dfrac{2^n}{2n+1}$ $\left\{\dfrac{2}{3}, \dfrac{4}{5}, \dfrac{8}{7}, \dfrac{16}{9}, \dfrac{32}{11}, ...\right\}$

   b) $a_n = \cos(\dfrac{n\pi}{2})$ $\{0, -1, 0, 1, 0, ...\}$

   c) $a_n = \dfrac{1}{(n+1)!}$ $\left\{\dfrac{1}{2}, \dfrac{1}{6}, \dfrac{1}{24}, \dfrac{1}{120}, \dfrac{1}{720}, ...\right\}$

   d) $a_1 = 2$, $a_{n+1} = \dfrac{a_n}{1+a_n}$ $\left\{2, \dfrac{2}{3}, \dfrac{2}{5}, \dfrac{2}{7}, \dfrac{2}{9}, ...\right\}$

   e) $a_n = \dfrac{(-2)^{n-1}}{5^n}$ $\left\{\dfrac{1}{5}, -\dfrac{2}{25}, \dfrac{4}{125}, -\dfrac{8}{625}, \dfrac{16}{3125}, ...\right\}$

2. Find a formula for the general term a_n of the sequence $\{\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8}, \frac{1}{10}, ...\}$, assuming that the pattern of the first few terms continues. *answer:* $a_n = \dfrac{1}{2n}$

3. Find a formula for the general term a_n of the sequence $\{\frac{1}{2}, \frac{-4}{3}, \frac{9}{4}, \frac{-16}{5}, \frac{25}{6}, ...\}$, assuming that the pattern of the first few terms continues. *answer:* $a_n = \dfrac{(-1)^{n+1}n^2}{n+1}$

4. Find a formula for the general term a_n of the sequence $\{4, -1, \frac{1}{4}, -\frac{1}{16}, \frac{1}{64}, ...\}$, assuming that the pattern of the first few terms continues. *answer:* $a_n = 4\left(\dfrac{-1}{4}\right)^{n-1}$ or $a_n = \dfrac{(-1)^{n+1}}{4^{n-2}}$

5. Find a formula for the general term a_n of the sequence $\{5, 8, 11, 14, 17, ...\}$, assuming that the pattern of the first few terms continues. *answer:* $a_n = 3n + 2$

6. Determine whether the sequence converges or diverges. If it converges, find the limit.

   (a) $a_n = \dfrac{3+5n^2}{n+n^2}$ Conv to 5

   (b) $a_n = 1 + \dfrac{10^n}{9^n}$ Diverge

   (c) $a_n = 2 + (0.86)^n$ Converge to 2

   (d) $a_n = \dfrac{\tan^{-1} n}{n}$ Converge to 0

   (e) $a_n = 3^n 7^{-n}$ Converge to 0

   (f) $a_n = \dfrac{3\sqrt{n}}{\sqrt{n}+2}$ Converge to 3

   (g) $a_n = e^{-1/\sqrt{n}}$ Converge to 1

   (h) $a_n = \dfrac{(2n-1)!}{(2n+1)!}$ Converge to 0

   (i) $a_n = \arctan(\ln(n))$ Converge to $\pi/2$

   (j) $a_n = \dfrac{\cos^2 n}{2^n}$ Converge to 0

   (k) $a_n = \left(1 + \dfrac{2}{n}\right)^n$ Converge to e^2

(l) $a_n = \sqrt{\dfrac{1+4n^2}{1+n^2}}$ Converge to 2