List the first five terms of the sequence.

1) $a_n = \dfrac{n+1}{3n-1}$ $\boxed{1, \dfrac{3}{5}, \dfrac{1}{2}, \dfrac{5}{11}, \dfrac{3}{7}}$

2) $a_n = \dfrac{3(-1)^n}{n!}$ $\boxed{-3, \dfrac{3}{2}, -\dfrac{1}{2}, \dfrac{1}{8}, -\dfrac{1}{40}}$

3) $a_1 = 4, \quad a_{n+1} = \dfrac{a_n}{a_n - 1}$ $\boxed{4, \dfrac{4}{3}, 4, \dfrac{4}{3}, 4}$

Find a formula for the general term a_n of the sequence, assuming that the pattern on the first few terms continues.

4) $\dfrac{1}{2}, \dfrac{1}{4}, \dfrac{1}{8}, \dfrac{1}{16}, \ldots$ $\boxed{a_n = \dfrac{1}{2^n}}$

5) 2, 7, 12, 17, ... $\boxed{a_n = 5n - 3}$

6) $-\frac{1}{4}, \frac{2}{9}, -\frac{3}{16}, \frac{4}{25}, \ldots$ $\boxed{a_n = (-1)^n \frac{n}{(n+1)^2}}$

7) 5, 1, 5, 1, 5, 1, ... $\boxed{a_n = 3 + 2(-1)^{n+1}}$

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

8) $a_n = n(n-1)$ Diverges

9) $a_n = \frac{3+5n^2}{n+n^2}$ Converges, 5

10) $a_n = \frac{2^n}{3^{n+1}}$ Converges, 0

11) $a_n = \frac{n}{1+\sqrt{n}}$ Diverges

12) $a_n = \frac{(-1)^n n^3}{n^3 + 2n^2 + 1}$ Diverges

13) $a_n = \cos\left(n/2\right)$ Diverges

14) $a_n = \dfrac{(2n-1)!}{(2n+1)!}$ Converges, 0

15) $a_n = \arctan\left(2n\right)$ Converges, $\dfrac{\pi}{2}$

16) $a_n = \dfrac{e^n + e^{-n}}{e^{2n} - 1}$ Converges, 0

17) $a_n = n^2 e^{-n}$ Converges, 0

18) $a_n = \dfrac{\cos^2 n}{2^n}$ Converges, 0

19) $a_n = \ln(n+1) - \ln(n)$ Converges, 0

20) $a_n = n\sin(1/n)$ Converges, 1

21) $a_n = \sqrt{n} - \sqrt{n^2 - 1}$ Diverges

22) $a_n = \left(1 + \frac{2}{n}\right)^{1/n}$ Converges, 1

23) 0, 1, 0, 0, 1, 0, 0, 0, 1, ... Diverges

24) $a_n = \frac{n!}{2^n}$ Diverges

Determine whether the sequence is increasing, decreasing, or not monotonic. Is the sequence bounded?

25) $a_n = \frac{1}{5^n}$ Decreasing, Bounded

26) $a_n = \frac{1}{2n+3}$ Decreasing, Bounded

27) $a_n = n + \frac{1}{n}$ Increasing, Unbounded

28) Find the limit of the sequence: $\sqrt{2}, \sqrt{2\sqrt{2}}, \sqrt{2\sqrt{2\sqrt{2}}}, \ldots$ 2