1) $a_n = \frac{n}{n+7}$

$a_1 = \frac{1}{8}, a_2 = \frac{2}{9}, a_3 = \frac{3}{10}, a_4 = \frac{4}{11}$

$a_{50} = \frac{50}{57}$

2) $d_n = n^2 - 2n$

$-1, 0, 3, 8, 15, 24$

$d_{50} = 50^2 - 100 = 2400$

3) $a_1 = 1 \quad a_n = 2a_{n-1}$

$1, 2, 4, 8$

$a_8 = 128$

4) $u_1 = 2, \ u_2 = 2 \quad u_n = u_{n-1} + u_{n-2}$

$2, 2, 4, 6$

$u_8 = 42$

5) $a_n = \frac{2n+1}{n}$

$\lim_{n\to\infty} a_n = 2$

a_n converges to 2.

6) $a_n = (-1)^n \frac{n-1}{n+1}$

$\lim_{n\to\infty} \frac{n-1}{n+1} = 1$

a_n diverges by oscillation

7) $a_n = 5 + (0.9)^n$

$\lim_{n\to\infty} (5 + (0.9)^n) = 5$

a_n converges to 5

8) $a_n = n \sin\left(\frac{7}{n}\right)$

$\lim_{n\to\infty} \left(n \sin\left(\frac{7}{n}\right)\right) = \infty \cdot 0$

$\lim_{n\to\infty} \frac{\sin \frac{7}{n}}{\frac{1}{n}} = \frac{0}{0}$

Using L'Hopital's Rule

$\lim_{n\to\infty} \frac{-\frac{7}{n^2}\cos\left(\frac{7}{n}\right)}{-\frac{1}{n^2}} = 7$

9) $\left\{\frac{3n^4}{n^4+1}\right\}$

$\lim_{n\to\infty} \frac{3n^4}{n^4+1} = 3$

10) $\lim_{n\to\infty} \left(\frac{5e^n + 1}{e^n}\right) = 5$