(1) Find a formula for the general term $a_n$ of the sequence, assuming that the pattern of the first few terms continues.
(a) $\{5, 8, 11, 14, 17, \ldots\}$
(b) $\{1, \frac{1}{3}, \frac{1}{5}, \frac{1}{7}, \frac{1}{9}, \ldots\}$
(c) $\{1, 0, -1, 0, 1, 0, -1, 0, \ldots\}$

(2) Determine whether or not the sequences $a_n$ converge, and if so find the limit:
(a) $a_n = \frac{8n-7}{7n+8}$
(b) $a_n = 10 - (0.99)^n$
(c) $a_n = \frac{(\ln n)^3}{n^2}$
(d) $a_n = \frac{n-e^n}{n+e^n}$
(e) $a_n = \cos \frac{n}{2}$
(f) $a_n = \frac{(2n-1)!}{(2n+1)!}$
(g) $a_n = 2^{-n} \cos \pi n$
(h) $a_n = \ln(2n^2 + 1) - \ln(n^2 + 1)$
(i) $a_n = \frac{e^n - e^{-n}}{e^{2n} - 1}$

(3) A fish farmer has 5000 catfish in his pond. The number of catfish increases by 10% per month and the farmer harvests 300 catfish per month.
(a) Show that the catfish population $P_n$ after $n$ months is given recursively by
$$P_n = 1.1P_{n-1} - 300; \quad P_0 = 5000$$
(b) By induction or otherwise, show that $P_n$ is decreasing and bounded below by 3000. Apply the Monotonic Sequence Theorem to show that $\lim_{n \to \infty} P_n$ exists.
(c) Find $\lim_{n \to \infty} P_n$.

(4) A sequence $a_n$ is given by $a_1 = \sqrt{2}; \quad a_n = \sqrt{2 + a_{n-1}}$
(a) By induction or otherwise, show that $a_n$ is increasing and bounded above by 2.
Apply the Monotonic Sequence Theorem to show that $\lim_{n \to \infty} a_n$ exists.
(b) Find $\lim_{n \to \infty} a_n$

(5) Find the limit of the sequence $\{\sqrt{2}, \sqrt{2\sqrt{2}}, \sqrt{2\sqrt{2\sqrt{2}}}, \sqrt{2\sqrt{2\sqrt{2\sqrt{2}}}}, \ldots\}$