1. Determine which of these are linear homogeneous recurrence relations with constant coefficients. Also, find the degree of those that are.   35%

   a) $a_n = 3a_{n-1} + 4a_{n-2} + 5a_{n-3}$

   b) $a_n = 2na_{n-1} + a_{n-2}$ **c)** $a_n = a_{n-1} + a_{n-4}$

   d) $a_n = a_{n-1} + 2$ **e)** $a_n = a_{n-1}^2 + a_{n-2}$

   f) $a_n = a_{n-2}$ **g)** $a_n = a_{n-1} + n$

   a) Degree 3 b) No. c) Degree 4 d) No e) No f) Degree 2 g) No

2. Solve these recurrence relations together with the initial conditions given. 35%

a) $a_n = 2a_{n-1}$ for $n \geq 1$, $a_0 = 3$
b) $a_n = a_{n-1}$ for $n \geq 1$, $a_0 = 2$
c) $a_n = 5a_{n-1} - 6a_{n-2}$ for $n \geq 2$, $a_0 = 1$, $a_1 = 0$
d) $a_n = 4a_{n-1} - 4a_{n-2}$ for $n \geq 2$, $a_0 = 6$, $a_1 = 8$
e) $a_n = -4a_{n-1} - 4a_{n-2}$ for $n \geq 2$, $a_0 = 0$, $a_1 = 1$
f) $a_n = 4a_{n-2}$ for $n \geq 2$, $a_0 = 0$, $a_1 = 4$
g) $a_n = a_{n-2}/4$ for $n \geq 2$, $a_0 = 1$, $a_1 = 0$

a) $a_n = 3 \cdot 2^n$ b) $a_n = 2$ c) $a_n = 3 \cdot 2^n - 2 \cdot 3^n$ d) $a_n = 6 \cdot 2^n - 2 \cdot n2^n$ e) $a_n = -1/2 \cdot n(-2)^n$ f) $a_n = 2^n - (-2)^n$ g) $a_n = (1/2)^{n+1} + (1/2)(-1/2)^n$

3. **a)** Determine values of the constants A and B such that $a_n = An + B$ is a solution of recurrence relation $a_n = 2a_{n-1} + n + 5$.   30%

b) Use Theorem 5 to find all solutions of this recurrence relation.

c) Find the solution of this recurrence relation with $a_0 = 4$.

a) $An + B = 2(A(n-1) + B) + n + 5$

$An + B = 2An - 2A + 2B + n + 5 = (2A + 1)n - 2A + 2B + 5$

a) $A = -1$, $B = -7$ **b)** $a_n = \alpha 2^n - n - 7$ **c)** $a_n = 11 \cdot 2^n - n - 7$