1.  The elementary second order reaction, $2A \rightarrow B$, is to be carried out in a CSTR. The entering concentration of A is 2 mol/L. The volume of the reactor is 19000 L, the volumetric flow rate = 3 L/s, and k = 0.03 L/ mol.s. Derive the design equation, and calculate the exit concentration using Polymath.

2.  The reaction $A \rightarrow B$ is to be carried out in a constant volume batch reactor, with $C_{Ao} = 1$ mol/L. The reaction rate $-r_A$ is first order in A, and the reaction rate constant is 0.36 $min^{-1}$. The final concentration is 0.001 mol/L. Derive the design equation, and calculate the required time using Polymath.