3. Consider the IVP:

\[ y' = y + 1 \quad y(0) = 0 \]

Use the method of successive approximations to obtain a sequence of functions \( \phi_n(t) \) that converge to the solution.

(a) Find an expression for an arbitrary \( \phi_n(t) \).

(b) Confirm that the sequence does indeed converge for every \( t \). **Hint:** Use the ratio test.

(c) Confirm that \( \phi(t) = \lim_{n \to \infty} \phi_n(t) \) is a solution to the IVP.

(d) Confirm that the solution found analytically (by separation of variables or integrating factors) is the same as that found by the method of successive approximations.