

7. [7 points] Bill has just built a brand new 90,000 L swimming pool. Bill is allergic to chlorine so instead he is using a filtration system to prevent algae from building up in the pool. Algae grows in the pool at a constant rate of 600 kg/day. The filtration system receives a constant supply of 70,000 L/day of water and returns the water to the pool with  $\frac{6}{7}$ ths of the algae removed. Let  $A(t)$  be the amount of algae in the pool in kilograms  $t$  days after Bill has filled the pool with fresh (algae free) water.
- a. [5 points] Write down the differential equation satisfied by  $A(t)$ . Include the initial condition.

$$\frac{dA}{dt} = \underline{\hspace{10cm}}$$

$$\text{Initial condition: } A(0) = \underline{\hspace{10cm}}$$

- b. [2 points] Find all the equilibrium solutions of the differential equation.
8. [4 points] Consider the differential equation  $y' = e^y$ . Solve the differential equation with initial condition  $y(0) = 1$ .