8. [12 points] The Resistance suddenly find themselves in a huge crisis! Chased by First Order's fleet, the Resistance members are deciding whether to evacuate their starship and flee in small transports, or to remain and fight. At every moment throughout the debate, every Resistance member is voting either to remain or flee, but members are continuously changing their vote. Votes change in the following way:

- The number of Resistance members who change their vote from fleeing to remaining is proportional to the number that is currently voting to flee
- The number of Resistance members who change their vote from remaining to fleeing is proportional to the number that is currently voting to remain
- These both have the **same** constant of proportionality k, where $k > 0$.

a. [4 points] Let P be the total number of Resistance members, and let $r(t)$ be the number of members vote to remain t minutes after the debate begins. Write a differential equation for $r(t)$ which models the scenario.

Answer: $\dfrac{dr}{dt} =$ _____

b. [3 points] Find all equilibrium solutions to your differential equation and determine whether they are stable. Interpret your answer in the context of the problem.

c. [5 points] At a moment when 60% of the Resistance members wish to remain, Princess Leia recovers, and the situation drastically changes. Now let R be the fraction of Resistance members who wish to remain t seconds after Leia's recovery, and suppose R satisfies the differential equation

$$\frac{dR}{dt} = -Re^t.$$

Find an explicit formula for $R(t)$. Show your work carefully.

Answer: $R(t) =$ _____