6. [10 points] At a hospital, a patient is given a drug intravenously at a constant rate of \( r \) mg/day as part of a new treatment. The patient’s body depletes the drug at a rate proportional to the amount of drug present in his body at that time. Let \( M(t) \) be the amount of drug (in mg) in the patient’s body \( t \) days after the treatment started. The function \( M(t) \) satisfies the differential equation

\[
\frac{dM}{dt} = r - \frac{1}{4} M \quad \text{with} \quad M(0) = 0.
\]

a. [7 points] Find a formula for \( M(t) \). Your answer should depend on \( r \).

b. [1 point] Find all the equilibrium solutions of the differential equation.

c. [2 points] The treatment’s goal is to stabilize in the long run the amount of drug in the patient at a level of 200 mg. At what rate \( r \) should the drug be administered?