Problem 3. (6 pts total) We encounter an Unobtainium-rich pool in a cave on the planet Pandora.

- A water-Unobtainium solution having a constant concentration of 4 kg/L flows into the pool at a constant rate of 0.3 L/h.
- It is known that the pool loses Unobtainium to radioactive decay at a rate of 6 percent by mass per hour.
- The well-mixed water-Unobtainium solution in the pool flows out of the pool at a rate of 0.3 L/h. The solution flowing out has the same concentration of Unobtainium as that of the well-mixed pool.
- Additionally, we will harvest Unobtainium directly from the pool, removing it at a constant rate of r kg per hour.
- When we arrive there are 5 liters of solution in the pool and 5 kilograms of Unobtainium dissolved in it.

(**a**) (3 pts) Write an initial value problem for $U(t)$, the mass of Unobtainium in the pool t hours after we arrive. Explain your answer using complete sentences.

For parts (b) and (c), assume that $\mathrm{r} = 0.4$.

(**b**) (1 pt) How quickly would the the mass of Unobtainium in the pool be changing at the exact moment there are 5 kilograms of it in the pool?

(**c**) (2 pts) Without solving the differential equation exactly, explain what would happen to the mass of Unobtainium in the pool over time as $t \to \infty$. Use complete sentences as part of your answer.