

6. [9 points] An extremely sleepy graduate student is grading Math 116 exams. She has been drinking coffee all day, but it just is not enough. She hooks up a caffeine drip that delivers caffeine into her body at a constant rate of 170 mg/hr. The amount of caffeine in her body decays at a rate proportional to the current amount of caffeine in her body. The half-life of caffeine in her body is 6 hours.
- a. [4 points] Using the blank provided, write a differential equation which models the scenario described above. Use  $Q(t)$  for the amount of caffeine in the graduate student's body, measured in mg,  $t$  for hours after she hooked up the caffeine drip, and  $k > 0$  for the constant of proportionality.

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

- b. [5 points] Use the half-life of caffeine to determine the constant of proportionality.