8. [15 points] Two zombies are chasing Jake down the Diag. Let $J(t)$ be Jake's position, measured in meters along the Diag, as he runs from the zombies. In this problem the time t is measured in seconds.

a. [3 points] The velocity of the first zombie is proportional to the difference between its own position, $S(t)$, and Jake's position, with constant of proportionality k. Using this fact, write the differential equation satisfied by $S(t)$.

b. [2 points] State whether your equation in part (a) is separable. Circle the correct answer.

The equation is: SEPARABLE NOT SEPARABLE

c. [9 points] The position of the second zombie at time t is given by the function $Z(t)$ (in meters), and satisfies the differential equation

$$\frac{dZ}{dt} = \alpha \frac{J(t)}{Z},$$

where α is a positive constant. Assuming that $Z(0) = 5$ and that Jake's position is given by $J(t) = 2t + 10$, find a formula for $Z(t)$.

d. [1 point] In the differential equation $\frac{dZ}{dt} = \alpha \frac{J(t)}{Z}$, what are the units of α?