Quiz: Let $x(t)$ be the temperature of my house in degrees Celsius with t in hours. Suppose it satisfies the ODE:

$$\frac{dx}{dt} + kx = kq_e(t).$$

1. What are the units on k?

2. What are the units on q_e?

Think about your answer and then look at the choices.

Choices:

1. Units on k:

   a) $\frac{\text{degrees}}{\text{hour}}$

   b) degees Celsius

   c) $\frac{1}{\text{hour}}$

   d) k is dimensionless

2. Units on q_e:

   a) $\frac{\text{degrees}}{\text{hour}}$

   b) degrees Celsius

   c) $\frac{1}{\text{hour}}$

   d) q_e is dimensionless

Pick what you think is the correct choice and then look at the answer.

Answer:

1. The units on k are $\frac{1}{\text{hour}}$. Since x is in degrees Centigrade and t has units in hours, $\frac{dx}{dt}$ has units $\frac{\text{degrees}}{\text{hour}}$. Thus kx has units $\frac{\text{degrees}}{\text{hour}}$, which implies k has units $\frac{1}{\text{hour}}$.

2. The units on q_e are degrees Celsius. From the equation we see that q_e has the same units as x.