

## Units

### Quiz: Units

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

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

1. What are the units on  $k$ ?
2. What are the units on  $T_e$ ?

### Choices:

1. Units on  $k$ :

- a)  $\frac{\text{degrees}}{\text{hour}}$    b) degrees Celsius   c)  $\frac{1}{\text{hour}}$    d)  $k$  is dimensionless

2. Units on  $T_e$ :

- a)  $\frac{\text{degrees}}{\text{hour}}$    b) degrees Celsius   c)  $\frac{1}{\text{hour}}$    d)  $T_e$  is dimensionless

### Answer:

1. The units on  $k$  are  $\frac{1}{\text{hour}}$ : Since  $x$  is in degrees Celsius 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  $T_e$  are degrees Celsius: From the equation we see that  $T_e$  has the same units as  $x$ .

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