1. **Exponentials**

Growth/decay described by the *differential equation*

\[
\frac{dy}{dt} = ky
\]

**General solution:** \( y = \)

**Exercise 1.** Consider an exponential decay modeled by

\[
\frac{dy}{dt} = -Ky, \quad K > 0
\]

Write the half-life \( t_{1/2} \) in terms of \( K \).

**Exercise 2** (Fukushima). Cesium 137 decays according to the law

\[
\frac{dC}{dt} = -kC,
\]

where \( C(t) \) is the amount of cesium 137 at time \( t \).

(a) Suppose that one-quarter of the sample remains after 60 years. What is the half-life of cesium 137?

(b) How long does it take for the amount of cesium to be reduced to 1%?
Exercise 3 (Squirrels). (*) Let $N(t)$ be the population of squirrels at UBC at time $t$, where time is measured in days. Coyotes are on a diet, so we assume the following rates

$$b = \frac{\text{per capita birth rate}}{\text{per day}} = 0.06$$

and

$$d = \frac{\text{per capita death rate}}{\text{per day}} = 0.01$$

How long does it take for the population to be doubled?