MA 16010 Lesson 35: Exponential Growth

Recall: A differential equation is an equation involving $t, y = y(t), y', y'' \ldots$

Today we consider equations of the form

$$y' = ky \qquad (k \text{ is a constant}). \qquad (*)$$

Observe/recall:

-
-
-

The general solution to the equation $(*)$ is:

Exercise: Solve the initial value problem $\quad \dfrac{dy}{dt} = 3y, \quad y(0) = 15.$

Exercise: Given that $\dfrac{dy}{dt} = 6y, \quad y(6) = 20,$ find $y(10)$.

Exponential growth model:

Exercise: The population of a culture of bacteria, $P(t)$, where t is time in days, is growing at a rate proportional to the population. The growth rate is 0.3 . If the initial population is $P(0) = 1000$,

(a) how big is the population after 10 days?

(b) how long will it take for the population to double?

Exercise: John currently has $ 8000 on a savings account at Bank A. On his account, the interest is compounded continuously, with the annual rate of interest 4.5%.

(a) How much will be in the account after 9 years? Round to nearest cent.

(b) John also has $ 10000 on an account at Bank B, also compounded continuously. The bank guarantees that this amount will grow to $12500 after 7 years. What is the annual interest rate?