

Linear Algebra Homework One: Corrected Version

College of the Atlantic

Due Friday January 11, 2019

This assignment is complete! I will not be adding any more problems.

Please include a cover sheet for this assignment.

Chapter 1.1:

1. 5
2. 9
3. 18
4. 36
5. Consider Newton's law of cooling

$$\frac{dT}{dt} = -k(T - A). \quad (1)$$

- (a) Show that $T(t) = A + Ce^{-kt}$ is a solution to Eq. (1), where C is a constant.
 - (b) Let the ambient temperature $A = 5$. Find the solution to Eq. (1) that has the value of $T = 40$ at $t = 0$. (This describes how an object that is initially at 40 degrees cools off if it is placed outside on a brisk 5 day.)
 - (c) Let $k = 0.1$, and as before $A = 5$. Using these values, sketch a plot of the $T(t)$ you found in the previous problem. It's fine to use a computer to make this plot for you, but think about why it has the shape it does. Does your plot make sense physically?
6. **Optional, but recommended.** Consider again the differential equation Eq. (1).
- (a) Define a new function $y = T - A$, the difference between the temperature T of the object and the ambient temperature A . After plugging in you should get another differential equation where $y(t)$ is the unknown function instead of $T(t)$.
 - (b) Hey! That new differential equation looks familiar. Write down its general solution.
 - (c) Then use the $y(t)$ you just figured out to write down the solution $T(t)$.

Chapter 1.2:

1. 1
2. 4
3. **Optional.** 43. Not particularly differential-equations-ey, but perhaps amusing.