# CST-305: Project 1 – Visualize ODE With SciPy

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Project: Visualize ODE With SciPy

## Responsibilities and Completed Tasks

This was an individual project. All tasks including research, coding, visualization, documentation, and testing were completed independently.

## System Performance Context Description

The focus of this project is modeling the heat dissipation behavior of a computer processor over time. This is a critical performance metric in computer systems, especially when CPUs operate under heavy loads. Understanding and predicting temperature changes helps design better cooling systems to avoid overheating.

## Specific Problem Solved

The project solves how the temperature of a CPU changes over time after being subjected to a spike in activity. This is modeled with a simple first-order linear ODE that reflects heat loss to the environment.

## Mathematical Approach

The ODE used is: dy/dt = -2y + 1  
This models a cooling system where y(t) is the temperature difference between the CPU and the environment. The constant -2 controls the rate of cooling and the '+1' represents a steady heat input.

## Implementation Approach

Python was used with the SciPy package to solve the ODE using the solve\_ivp function. The output is visualized with Matplotlib. The code defines the equation, sets the time range and initial value, solves it numerically, and saves the result as a plot image.

## Screenshots

A screenshot of a computer

AI-generated content may be incorrect.

## A graph of a heat dissipation model AI-generated content may be incorrect. References

* SciPy Documentation: <https://docs.scipy.org/>
* Matplotlib Documentation: <https://matplotlib.org/>
* Bronson, R. and Costa, G. (2022). *Schaum's outline of differential equations* (5th ed.). McGraw-Hill: New York, NY. ISBN-13: 9781264258826
* Python Official Docs: https://docs.python.org/3/