Writing assignment 4: Damped oscillators.

In this writing assignment you analyze the damped oscillator equation

$$m\frac{d^2y}{dt^2} + b\frac{dy}{dt} + ky = 0. \qquad (\heartsuit)$$

The main goal of your report is to explain how the value of the damping coefficient b impacts the behavior of solutions.

- Begin your report with a description of solutions to $(\heartsuit)$ in the case that $b = 0$. This is called the ***undamped*** setting.

  In this part of the report you should indicate how the values of k and m affect solutions. Do this by making statements of the form *When m is large relative to k, the solutions...*

  Note: To type $m \ll k$ or $m \gg k$, use the code `$m\ll k$` or `m\gg k$`.

- For the remainder of the report, assume $b > 0$. You should find that for certain values of b, solutions to $(\heartsuit)$ do not oscillate at all. This is called the ***overdamped*** case. The other cases are called ***underdamped*** and ***critically damped***. Describe all three cases in as much detail as you can.

- Your report should include graphics that illustrate the behavior of typical solutions. In order to generate the graphics, you need to choose some actual numbers. However, your discussion should be entirely in terms of m, b, and k. Thus the reader will never know the numbers that you used to generate the plots.