Project 3: Tacoma Narrows Simulation

**Analysis:**

This analysis focuses on a boundary value problem that defines the motion of the Tacoma Narrows Bridge under a load caused by the wind. A 12 meter wide, one foot long section of bridge, with a mass of 2500 kg is suspended by a cable on each end. Before the wind is turned on in this model, the bridge is at static equilibrium and the center point of the roadway is defined to be the zero reference point for the vertical direction. This model defines tension in the cable to be positive, so this means y(t), the distance away the center of the bridge is from its equilibrium point, is positive downwards. This model hypothesize a non-linear spring response in the cables that causes the tensile force to be greater than the compressive force and, as a result, the restoring force on the cables is smaller during the bridge’s upward oscillation.

**Computer Program:**

Asda

**Results:**

When the simulation is ran at the extreme end of wind speed, it is interesting to note that while the bridge doesn’t sink too far down at first, just barely off the axis, after the bridge reaches momentary equilibrium and the restoring force pulls it back up, the compressive force is so disproportionately weak in response that the bridge disappears completely above and away from the grid for the duration of the sampling time, simulating the bridge getting completely blown away.