Problems

1. A spring with a 4 – kg mass has a natural length of 1 metre, and is maintained stretched to a length of 1.3 metres by a force of 24.3 N. If the spring is compressed to a length of 0.8 and then released with zero velocity, find the position function. Assuming no damping.

$m = 4$ and $\gamma = 0$. We can determine the spring constant, $k$ by noting that a force of 24.3 N stretches the spring to a length of 1.3 m, this means that the force results in a 0.3 m stretch of the spring

\[ k = \frac{24.3}{0.3} = 81 N/m \]

therefore our ode is

\[ 4u'' + 81u = 0 \]
\[ u(0) = -\frac{4}{5} \quad u'(0) = 0 \]

Solving the ode yields

\[ u(t) = c_1 \cos \left( \frac{9}{2}t \right) + c_2 \sin \left( \frac{9}{2}t \right) \]

and using the initial conditions to solve for constants

\[ u(t) = -\frac{4}{5} \cos \left( \frac{9}{2}t \right) \]

Reading

Pages 147-149.

Have a good weekend!