Worksheet 03/30 solutions

Problems

1. A spring with a $4 - kg$ mass has a natural length of $1metre$, and is maintained stretched to a length of $1.3metres$ by a force of $24.3N$. 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 notig that a force of $24.3N$ strecthes the spring to a length of $1.3m$, this means that the force results in a $0.3m$ strecth of the spring

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

    therefore our ode is

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

    Solving the ode yeilds

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

    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!