Problem 1.51

[Computer] Repeat all of Problem 1.50 but using the initial value $\phi_0 = \pi/2$.

Solution

Equation (1.51) is on page 31.

$$\ddot{\phi} = -\frac{g}{R}\sin\phi \tag{1.51}$$

With $R = 5$ m and $g = 9.8$ m/s^2 and $\phi_o = \pi/2$, the initial value problem to solve is

$$\ddot{\phi} = -\frac{9.8}{5}\sin\phi, \quad \phi(0) = \frac{\pi}{2}, \quad \phi'(0) = 0$$

$$\ddot{\phi} = -1.96\sin\phi, \quad \phi(0) = \frac{\pi}{2}, \quad \phi'(0) = 0.$$

Note that $\phi(0) = \pi/2$ is the angle at $t = 0$, and $\phi'(0) = 0$ indicates that the particle starts from rest. To numerically solve this, type

$$\mathtt{s = NDSolve}\left[\left\{\phi''[t] == -1.96\sin[\phi[t]],\ \phi[0] == \frac{\pi}{2},\ \phi'[0] == 0\right\}, \phi, \{t, 0, 21\}\right]$$
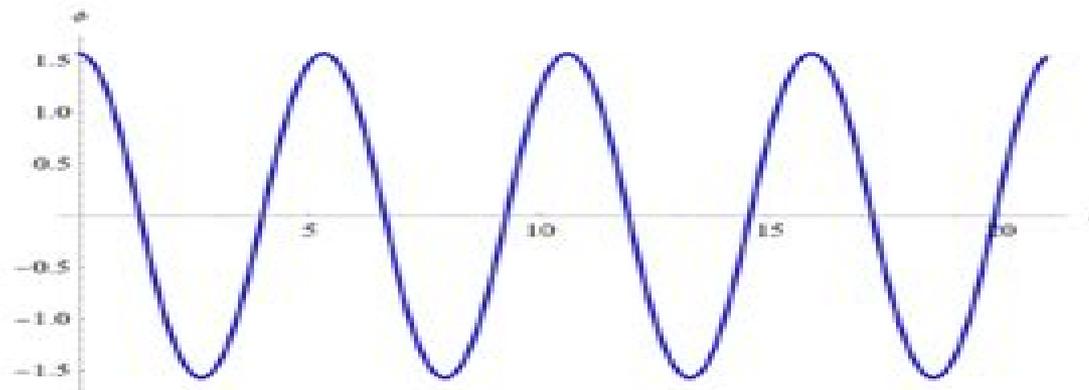
into Mathematica and press **Shift+Enter**. The output below is given as a result.

$$\left\{\left\{\phi \to \mathtt{InterpolatingFunction}[]\right\}\right\}$$

In order to plot this function, type

$$\mathtt{Plot}\left[\mathtt{Evaluate}[\phi[t]\ /.\ \mathtt{s}],\ \{t, 0, 21\},\ \mathtt{PlotRange} \to \mathtt{All},\ \mathtt{AxesLabel} \to \{t, \phi\},\ \mathtt{PlotStyle} \to \mathtt{Blue}\right]$$

into Mathematica and press **Shift+Enter** to obtain the following graph.

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Tai L. Chow

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Introduction to Classical Mechanics David Morin,2008   Classical Mechanics, Volume 2 K Likharev,2018-04-30

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ordinary, first order. (c) partial, second order. (e) ordinary, third order. (g) ordinary, second order. Answers to Even-Numbered Exercises How can you keep other users from using write to communicate with you? Why would you want to? Give the command mesg n to keep ordinary users from writing to ... Why do some science or math books only have answers ... Jan 30, 2015 — Some science and math books only provide answers to odd or even numbered questions as a way to encourage students to practice ... MARK G. SObELL A PRACTICAL GUIDE TO LINUX ... by MG SObELL · 2013 · Cited by 55 — ... EXERCISES. 1. The following message is displayed when you attempt to log in with an incorrect username or an incorrect password: Page 81. ADVANCED EXERCISES ... ANSWERS TO EVEN-NUmbERED EXERCISES - Sobell Jul 27, 2013 — Answers to Even-numbered Exercises
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