Homework 6

Due date: April 11, 2016, 11:55PM.

Bibliography: Course lecture notes Lessons 21-26. Textbook pp. 395-424, Sections 8.2-8.4.

We continue study of the properties and applications of eigenvalues and eigenvectors. After understanding the basic computational procedures in Q2, Q3, feel free to use Octave to carry out arithmetic.

1. (1 course point) Textbook p.409, Exercises 8.3.11-8.3.14
2. (1 course point) Textbook p.412, Exercise 8.3.15
3. (1 course point) Textbook p.412, Exercise 8.3.20
4. (1 course point) Textbook p.412, Exercises 8.3.23, 8.3.28
5. (Computer application 4 course points) We continue our investigation of systems of masses and springs.

   Task 1. (2 course points). Read Section 9.5 of textbook, pp. 485-491. Write an Octave/Matlab script to reproduce Fig. 9.7 and 9.8 from textbook, and show the motion of the 3 point masses from Example 9.36 (p. 491).

   Task 2. (1 course point). Write Octave code to repoduce Fig. 9.10, p.498 of textbook.

   Task 3. (1 course point). Write Octave code to repoduce Fig. 9.11, Fig. 9.12, pp.502-503 of textbook.

Hint. In the above you're asked to generate plots of time-varying functions. Here's the procedure to reproduce Fig. 9.5, p. 487.

Theory $u(t)=v\cos(\omega t)$, $\omega=2\pi/T=2\pi f$. Set parameters $T=1$, $v=1$.

```
octave> T=1.; v=1.; omega=2*pi/T;
octave>
```

Choose a time interval containing two periods, and sample it with step size $\Delta t=T/50$.

```
octave> dt=T/50.; t=0.:dt:2*T;
octave>
```

Evaluate and plot the displacement function $u(t)$

```
octave> u=v*cos(omega*t);
octave> plot(t,u,'-b');
octave> xlabel('t'); ylabel('u'); title('Displacement as a function of time');
octave> cd /home/student/courses/MATH547/homework; print -mono -deps hw5Fig9.5.eps;
octave>
```

The above instructions will produce a plot somewhere on the screen. Using a screen capture utility, save the displayed figure to a png file and import it into your writeup

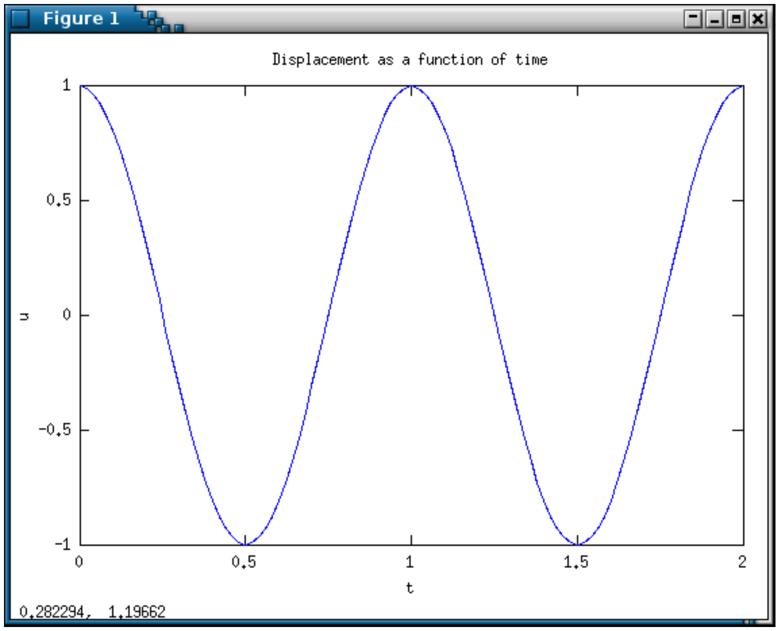

Figure 1. Reproduction of Fig. 9.5 of textbook.