

EE 271 Homework 2

Problems 29 and 32 due 8/30/19

Problem 31 due Monday 9/02/19

29. The Fourier series is a series representation of a periodic function in terms of sines and cosines. The Fourier series representation of the function

$$f(x) = \begin{cases} 1 & 0 < x < \pi \\ -1 & -\pi < x < 0 \end{cases}$$

is

$$\frac{4}{\pi} \left( \frac{\sin x}{1} + \frac{\sin 3x}{3} + \frac{\sin 5x}{5} + \frac{\sin 7x}{7} + \dots \right)$$

Plot on the same graph the function  $f(x)$  and its series representation, using the four terms shown.

30. A cycloid is the curve described by a point  $P$  on the circumference of a circular wheel of radius  $r$  rolling along the  $x$  axis. The curve is described in parametric form by the equations

$$x = r(\phi - \sin \phi)$$

$$y = r(1 - \cos \phi)$$

Use these equations to plot the cycloid for  $r = 10$  in. and  $0 \leq \phi \leq 4\pi$ .

31. A boat moves at 20 km/hr along a straight path described by  $y = 11x/15 + 43/3$ , starting at  $x = -10$ ,  $y = 7$ . Plot the angle (in degrees) of the line of sight from an observer at the coordinate origin to the boat as a function of time for 3 hours.

Section 1.4

32. Determine which search path MATLAB uses on your computer. If you use a lab computer as well as a home computer, compare the two search paths. Where will MATLAB look for a user-created M-file on each computer?
33. A fence around a field is shaped as shown in Figure P33. It consists of a rectangle of length  $L$  and width  $W$  and a right triangle that is symmetric about the central horizontal axis of the rectangle. Suppose the width  $W$  is known (in meters) and the enclosed area  $A$  is known (in square meters). Write a MATLAB script file in terms of the given variables  $W$  and  $A$  to determine the length  $L$  required so that the enclosed area is  $A$ . Also determine the total length of fence required. Test your script for the values  $W = 6$  m and  $A = 80$  m<sup>2</sup>.

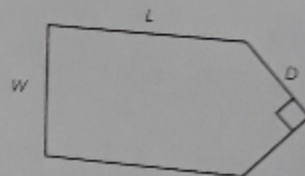


Figure P33