

### Computer Exercise 1.4.6

This program will evaluate the following function

$$f(x) = \sin(x) - 1 + \cos(x)$$

$$\Rightarrow f(x) = \sin(x) - 2\sin^2(x)$$

The latter version of the function is what's used to perform the evaluations since it is a form such that loss of significance is minimized on the interval  $[0, \frac{\pi}{4}]$ . We wish to evaluate  $f(x)$  to nearly full machine precision on various values of the aforementioned interval.

```
format long %display 15 decimal places

xvals0 = linspace(0, pi/4, 50);

yvals0 = p6(xvals0);

%use transpose arrays to display as a table
xvals = xvals0';
yvals = yvals0';

T = table(xvals, yvals);
disp(T)
```

xvals	yvals
0	0
0.0160285339468867	0.015899393430105
0.0320570678937734	0.031537793772343
0.0480856018406601	0.0469111833903016
0.0641141357875468	0.0620156127310493
0.0801426697344335	0.076847201339809
0.0961712036813202	0.0914021388568799
0.112199737628207	0.10567668599655
0.128228271575094	0.119667175507752
0.14425680552198	0.133370013116208
0.160285339468867	0.146781678447829
0.176313873415754	0.159898725933134
0.19234240736264	0.172717785692438
0.208370941309527	0.185235564401606
0.224399475256414	0.197448846138138
0.2404280092033	0.209354493207362
0.256456543150187	0.220949446948537
0.272485077097074	0.232230728520647
0.288513611043961	0.243195439667693
0.304542144990847	0.253840763463275
0.320570678937734	0.264163965034289
0.336599212884621	0.274162392263535
0.352627746831507	0.283833476471068
0.368656280778394	0.293174733074118
0.384684814725281	0.302183762225396
0.400713348672168	0.310858249429635
0.416741882619054	0.319195966138206
0.432770416565941	0.327194770321649
0.448798950512828	0.334852607019977
0.464827484459714	0.342167508870617

0.480856018406601	0.349137596613835
0.496884552353488	0.355761079575543
0.512913086300374	0.362036256127327
0.528941620247261	0.367961514123621
0.544970154194148	0.373535331315871
0.560998688141034	0.378756275743621
0.577027222087921	0.383623006102389
0.593055756034808	0.388134272088267
0.609084289981695	0.392288914719125
0.625112823928581	0.396085866632375
0.641141357875468	0.399524152359173
0.657169891822355	0.402602888575034
0.673198425769241	0.405321284326763
0.689226959716128	0.407678641235657
0.705255493663015	0.409674353676923
0.721284027609902	0.411307908935271
0.737312561556788	0.412578887336632
0.753341095503675	0.41348696235598
0.769369629450562	0.414031900701214
0.785398163397448	0.414213562373095

On the left column are the x values displayed in long format. On the right column are the y values displayed in long format. Fifty different values

evaluated on the interval  $\left[0, \frac{\pi}{4}\right]$  have been displayed.

```
function y=p6(x)
    y = sin(x) - 2.*((sin(x./2)).^2);
end
```