Math 3890, Machine Problem 5: Due Tu., 2/23/21

1) Write a function `c = lsc(d,y,m,p,q,f,ua,ub)` that finds the coefficient vector of the spline s of degree d with extended knot vector y which uses least-squares collocation to solve the two-point value problem $u'' + pu' + qu = f$ on an interval $[a, b]$. The function
   a) should select collocation points at the interior knots and at m equally-spaced points in the interior of each subinterval of the partition.
   b) enforce the boundary conditions $s(a) = ua$ and $s(b) = ub$.
   c) use least-squares to solve the collocation equations for the coefficients $c_2, \ldots, c_{n-1}$ where n is the dimension of the spline space.

2) Write a script to use your function. It should
   a) set values for a and b
   a) define anonymous functions p, q, u for testing.
   b) set f = uxx + p*ux + q*u, where ux, uxx are anonymous funtions giving the derivatives of u.
   c) input d and k and set up y using k equally spaced interior knots in $[a, b]$.
   d) call `lsc` to compute the coefficient vector
   e) compute and print the max and RMS errors on 301 equally-spaced points in the interval $[a, b]$.
   h) plot s using the 301 sample points

3) Run your script with $a = 0$, $b = 1$, $p = exp(x)$, $q = \sin(x^2)$ and $u = \cos(x) + \sin(3x)$ for $d = 3$ and $k = 17$.

4) Repeat 3) with $d = 3, k = 33$.

5) Repeat with $d = 5$ and $k = 17, 33$.

6) NOTE – It is enough to turn in one plot as they all look the same