Leon van Dommelen Exam 2

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```
*** DO NOT PUT YOUR SOLUTIONS IN THIS FILE ***
```

Instead put your solutions for questions 1, 2, and 3 in files q1.m, q2.m, and q3.m.

```
*** DO ONLY MINIMAL EDITING OF THIS FILE ***
```

There is only one thing you may do inside this file: **If** you ran script q1 from the command window, and **if** it ran correctly and **if** you no longer need to make changes, change the line "%q1" into "q1", i.e. delete the % at the beginning of the line.

Warning:** If you lose or add just a single space or blank line in this file, it may fail to work correctly.

Exam 2 11/21/17 initialization

```
format compact
more off
```

Question 1

```
%% Question 1
%
% Below is my solution to question 1 (except for any function files)

% initialize
format compact

% print a header above the results:
disp(' Start of results for question 1')

% set number of equations and unknowns
n=5

% initialize the matrix of the system to zeros
A=zeros(n);
% in a for loop, add the nonzero elements in each equation
for i = 1:n
  A(i,i)=-3;
  if i==1
```

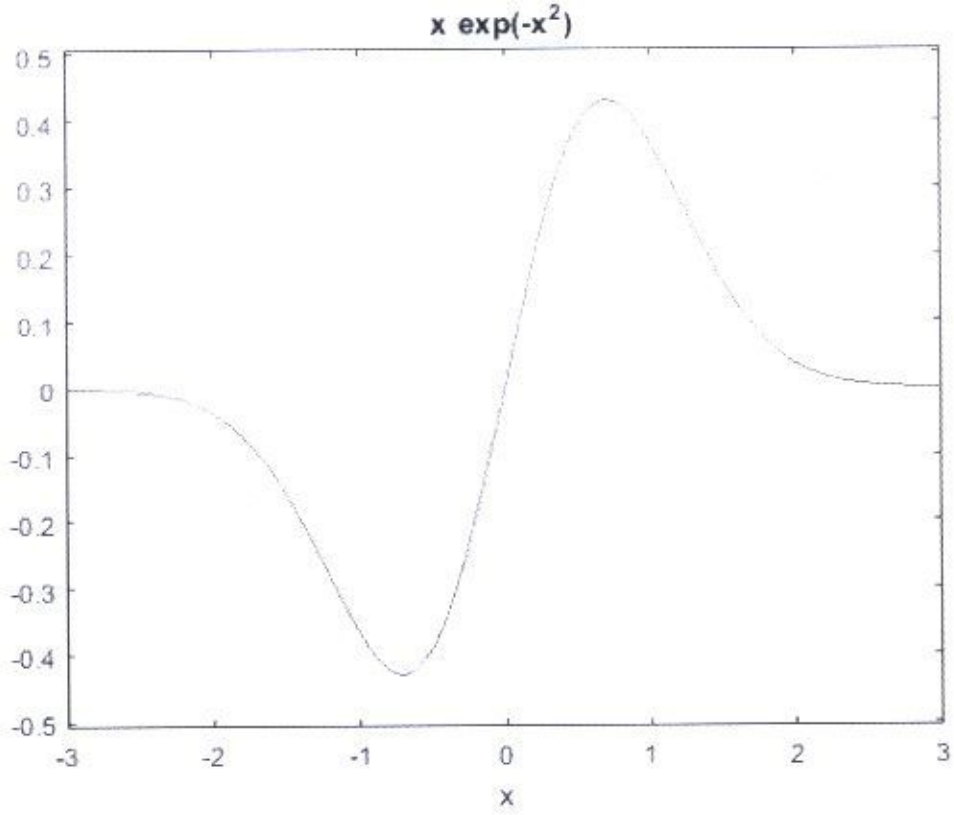
```
    A(i,n)=1;
  else
    A(i,i-1)=1;
  end
  if i==n
    A(i,1)=1;
  else
    A(i,i+1)=1;
  end
end

% right hand side vector
b=[1:n]';

% display the results
[A b]

% check condition number
condA=cond(A)
relErrMatlab=condA*eps(1)
if relErrMatlab > 0.1
    % print an error message
    error('*** The matrix is singular to working precision')
else
    % solve the system
    T=A\b;
    % show the solution
    TRow=T'
end


% run q1 (remove the next % when q1 works)
q1
```

```
 Start of results for question 1
n =
     5
ans =
    -3     1     0     0     1     1
     1    -3     1     0     0     2
     0     1    -3     1     0     3
     0     0     1    -3     1     4
     1     0     0     1    -3     5
condA =
    4.6180
relErrMatlab =
   1.0254e-15
TRow =
   -2.3636   -2.4545   -3.0000   -3.5455   -3.6364
```

Question 2

```
%% Question 2
%
% Below is my solution to question 2 (except for any function files)

% initialize
format compact

% print a header above the results:
disp(' Start of results for question 2')

% plot the given function
ezplot('x*exp(-x^2)',[-3 3])
grid on

% Find the partial fraction expansion of the ratio s/(s^3+4s^2+s+4)
syms s
partFrac=partfrac(s/(s^3+4*s^2+s+4))

% form Quartic
syms x
Q=x^4-2*x^3+22*x-9
% factor it
factoredQ=prod(factor(Q))
% find roots
rootsQ=solve(Q==0,x)
% find derivative and antiderivative
diffQ=diff(Q)
intQ=int(Q)
% integrate exactly from 0 to 2
int02Q=int(Q,0,2)


% run q2 (remove the next % when q2 works)
q2
```

```
 Start of results for question 2
partFrac =
((4*s)/17 + 1/17)/(s^2 + 1) - 4/(17*(s + 4))
Q =
x^4 - 2*x^3 + 22*x - 9
factoredQ =
(x^2 + 2*x - 1)*(x^2 - 4*x + 9)
rootsQ =
  - 2^(1/2) - 1
 2 - 5^(1/2)*1i
 2 + 5^(1/2)*1i
    2^(1/2) - 1
diffQ =
4*x^3 - 6*x^2 + 22
intQ =
x^5/5 - x^4/2 + 11*x^2 - 9*x
int02Q =
122/5
```



Question 3

```
%% Question 3
%
% Below is my solution to question 3 (except for any function files)

% initialize
format compact

% print a header above the results:
disp(' Start of results for question 3')

% define the data
VMeasured=[15  20  25  30  40  50  60  75   90 ]
LMeasured=[60 105 175 255 430 670 940 1600 2100]
VMeasured=VMeasured';
LMeasured=LMeasured';

% find C and p
lnVMeasured=log(VMeasured);
lnLMeasured=log(LMeasured);
coefs=polyfit(lnVMeasured,lnLMeasured,1);
p=coefs(1)
C=exp(coefs(2))
```

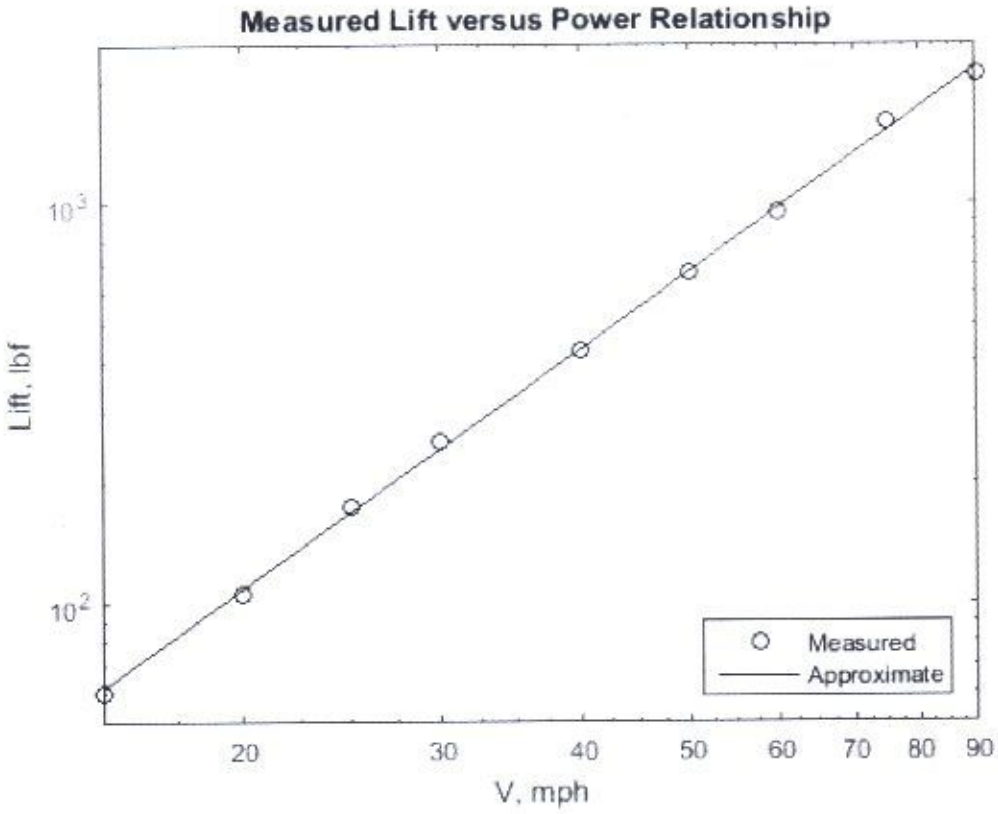
```
% find approximate values
LPower=C*VMeasured.^p;

% plot it
loglog(VMeasured,LMeasured,'ok',VMeasured,LPower,'-k')
axis([15 90 50 2500])
title('Measured Lift versus Power Relationship')
xlabel('V, mph')
ylabel('Lift, lbf');
legend('Measured','Approximate','location','southeast')

% comment
disp('Seems reasonable to me.')


% run q3 (remove the next % when q3 works)
q3

 Start of results for question 3
VMeasured =
    15    20    25    30    40    50    60    75    90
LMeasured =
  Columns 1 through 6
          60         105         175         255         430
 670
  Columns 7 through 9
         940        1600        2100
p =
    1.9953
C =
    0.2750
Seems reasonable to me.
```

20
33
13

④ define Vmeasured
④ take logs
④ poly fit.
④ p and C
④ find approx

② log log
② black
② circles/line
② axis sizes

① title
① labels on axes
① legend
① legend pos.
① disp



End of Exam

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