Assignment 1

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This is a template file for the first assignment to get started with running and publishing code in Matlab. Each problem has its own section (delineated by %%) and can be run in isolation by clicking into the particular section and pressing `Ctrl` + `Enter` (evaluate current section).

To generate a pdf for submission in your current directory, use the following three lines of code at the command window:

```
>> options.format = 'pdf';
>> options.outputDir = pwd;
>> publish('assignment1.m', options)
```

Problem 1

a)

```
x = 5
% b)
y = 4.2 * 10 ^ (-2)
% c)
r = sqrt(pi)
% d)
rate = 0.01
t = 6
T = 12
money = 1000
interest = money * (exp(rate * t / T) - 1)
% e)
a = 1 + i
b = i
i = 2
e = exp(i * pi)
d = exp(b * pi)
% \texttt{i} is interpreted as the imaginary unit when assigning to a
 and b
% until it is defined to 2. In the subsequent expressions \textit{i}
 is
% interpreted as 2.
c = exp(1i * pi)
```

```
% Here \textit{1i} is interpreted as the imaginary unit, making $c =
 1$
```

```
x =

     5

y =

    0.0420

r =

    1.7725

rate =

    0.0100

t =

     6

T =

    12

money =

        1000

interest =

    5.0125

a =

     3

b =

     2
```

```
i =

     2


e =

  535.4917


d =

  535.4917


c =

  -1.0000 + 0.0000i
```

Problem 2

```
A = [1 -2 0 ; -2 1 -2; 0 -2 1]
Z = zeros(9,9)
B = ones(9,9) * 3
C = (eye(9) - 1) * -1
D = diag([1:5,4:-1:1])
E = repmat(transpose(1:9), 1, 5)


A =

     1    -2     0
    -2     1    -2
     0    -2     1


Z =

     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0


B =

     3     3     3     3     3     3     3     3     3
```

```
     3     3     3     3     3     3     3     3     3
     3     3     3     3     3     3     3     3     3
     3     3     3     3     3     3     3     3     3
     3     3     3     3     3     3     3     3     3
     3     3     3     3     3     3     3     3     3
     3     3     3     3     3     3     3     3     3
     3     3     3     3     3     3     3     3     3
     3     3     3     3     3     3     3     3     3
```

C =

```
     0     1     1     1     1     1     1     1     1
     1     0     1     1     1     1     1     1     1
     1     1     0     1     1     1     1     1     1
     1     1     1     0     1     1     1     1     1
     1     1     1     1     0     1     1     1     1
     1     1     1     1     1     0     1     1     1
     1     1     1     1     1     1     0     1     1
     1     1     1     1     1     1     1     0     1
     1     1     1     1     1     1     1     1     0
```

D =

```
     1     0     0     0     0     0     0     0     0
     0     2     0     0     0     0     0     0     0
     0     0     3     0     0     0     0     0     0
     0     0     0     4     0     0     0     0     0
     0     0     0     0     5     0     0     0     0
     0     0     0     0     0     4     0     0     0
     0     0     0     0     0     0     3     0     0
     0     0     0     0     0     0     0     2     0
     0     0     0     0     0     0     0     0     1
```

E =

```
     1     1     1     1     1
     2     2     2     2     2
     3     3     3     3     3
     4     4     4     4     4
     5     5     5     5     5
     6     6     6     6     6
     7     7     7     7     7
     8     8     8     8     8
     9     9     9     9     9
```

Problem 3

```
A = fliplr(A)
B(2, :) = repmat(1, 1, 9)
```

```
C(1, :) = []
F = E(1:2, 1:2)
E(:, 1) = flipud(E(:, 1))


A =

     0    -2     1
    -2     1    -2
     1    -2     0


B =

     3     3     3     3     3     3     3     3     3
     1     1     1     1     1     1     1     1     1
     3     3     3     3     3     3     3     3     3
     3     3     3     3     3     3     3     3     3
     3     3     3     3     3     3     3     3     3
     3     3     3     3     3     3     3     3     3
     3     3     3     3     3     3     3     3     3
     3     3     3     3     3     3     3     3     3
     3     3     3     3     3     3     3     3     3


C =

     1     0     1     1     1     1     1     1     1
     1     1     0     1     1     1     1     1     1
     1     1     1     0     1     1     1     1     1
     1     1     1     1     0     1     1     1     1
     1     1     1     1     1     0     1     1     1
     1     1     1     1     1     1     0     1     1
     1     1     1     1     1     1     1     0     1
     1     1     1     1     1     1     1     1     0


F =

     1     1
     2     2


E =

     9     1     1     1     1
     8     2     2     2     2
     7     3     3     3     3
     6     4     4     4     4
     5     5     5     5     5
     4     6     6     6     6
     3     7     7     7     7
     2     8     8     8     8
     1     9     9     9     9
```

Problem 4

```
geteps
getxmin
getxmax

function myeps = geteps
    y = 1;
    x = 2 * y;
    while 1 + y ~= 1
        x = y;
        y = y / 2;
    end
    myeps = x;
end

function xmin = getxmin
    y = 1;
    x = 2 * y;
    while y ~= 0
        x = y;
        y = y / 2;
    end
    xmin = x;
end

function xmax = getxmax
    y = 1;
    x = y;
    while y ~= +inf
        x = y;
        y = y * 2;
    end
    xmax = typecast(bitor(typecast(x, 'uint64'),
 0x000FFFFFFFFFFFFF), ...
        'double');
end
% geteps does not differ from eps, as getxmax does not differ from
 realmax.
% However, getxmin returns the nearest positive floating point value
 to 0
% including denormalized numbers, while realmin returns the smallest
% (ignoring sign) non denormalized floating point number.


ans =

   2.2204e-16


ans =
```

```
    4.9407e-324

ans =

    1.7977e+308
```

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