

ICE for Week 2

Creating and Indexing Matrices

- Problem 1

Think about what would be produced by the following sequence of statements and expressions, and then type them in to verify your answers:

```
pv = 2:2:8
```

```
pv(4) = 33
```

```
pv(6) = 11
```

```
prac = pv(3:5)
```

```
linspace(4,12,3)
```

Colon Notation

- Problem 2

Find an efficient way to generate the following matrix:

`mat =`

7	8	9	10
12	10	8	6

- Then, give expressions that will, for the matrix *mat*,
 - Refer to the element in the first row, third column
 - Refer to the entire second row
 - Refer to the first two columns

Colon notation

- Problem 3

Using the colon operator, create the following vectors

3	4	5	6	
1.0000	1.5000	2.0000	2.5000	3.0000
5	4	3	2	

- Problem 4

Using the **linspace** function, create the following vectors:

4	6	8		
-3	-6	-9	-12	-15
9	7	5		

Colon notation

- Problem 5

Think about what would be produced by the following sequence of statements and expressions, and then type them to verify your answers.

```
m = [1:4; 3 11 7 2]
m(2,3)
m(:,3)
m(4)
size(m)
numel(m)
reshape(m,1,numel(m))
vec = m(1,:)
vec(2) = 5
vec(3) = []
vec(5) = 8
vec = [vec 11]
```

Random number generation

- Problem 6

Generate a random:

- Real number in the range from 0 to 1
- Real number in the range from 0 to 20
- Real number in the range from 20 to 50
- Integer in the range from 0 to 10
- Integer in the range from 0 to 11
- Integer in the range from 50 to 100

Create matrices with random dimension

- Problem 7

Create a variable, *rows*, which is a random integer in the range from 1 to 5. Create a variable, *cols*, which is a random integer in the range from 1 to 5. Create a matrix of all zeros with the dimensions given by the values of *rows* and *cols*.

Vectorization

- Problem 8

Create a vector, x , which consists of 20 equally spaced points in the range from $-\pi$ to $+\pi$. Create a y vector that is **$\sin(x)$** .

Data input and output

- Problem 9

Create a script that would prompt the user for a temperature, and then 'F' or 'C', and store both inputs in variables. For example, when executed it would look like this (assuming the user enters 85 and then F):

```
Enter the temperature: 85  
Is that F or C?: F
```

Plot

- Problem 10

Write a script that plots **exp(x)** and **log(x)** for values of x ranging from 0.5 to 2.5.

- Problem 11

The ideal gas law is given by↵

$$P = \frac{nRT}{V} \quad \leftarrow$$

The van der Waals equation corrects for high pressure effects and is given by↵

$$P = \frac{nRT}{V - nb} - \frac{n^2 a}{V^2} \quad \leftarrow$$

Plot pressure vs. volume for n=1, T=300K, R=0.08206 L-atm/mol-K, a=1.39 L²-atm/mol², and b=0.039 L/mol. Use 0.08<V<6 liters↵