

- Previous Lecture:
 - Developing algorithms
 - Nested loops
- Today's Lecture:
 - Developing algorithms
 - Finite/inexact arithmetic
 - Discrete vs. continuous
- Announcements:
 - Project 2 due today at 6pm
 - Prelim 1 on 2/21 (Thurs) 7:30pm

Patriot missile failure



In 1991, a Patriot Missile failed, resulting in 28 deaths and about 100 injured. The cause?

0.1

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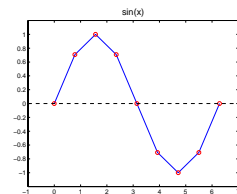
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Generating tables and plots

x	sin(x)
0.000	0.000
0.784	0.707
1.571	1.000
2.357	0.707
3.142	0.000
3.927	-0.707
4.712	-1.000
5.498	-0.707
6.283	0.000

```
x = linspace(0,2*pi,9);
y = sin(x);
plot(x,y)
```



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Built-in function linspace

```
x = linspace(1,3,5)
```

x	1.0	1.5	2.0	2.5	3.0
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x is a **vector**—one-dimensional list of values

x is an **array**

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Built-in function linspace

```
x = linspace(1,3,5)
```

x	1.0	1.5	2.0	2.5	3.0
---	-----	-----	-----	-----	-----

```
x = linspace(0,1,101)
```

x	0.00	0.01	0.02	...	0.99	1.00
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Left endpoint

Right endpoint

Number of points

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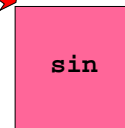
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How did we get all the sine values?

x	sin(x)
0.00	0.0
1.57	1.0
3.14	0.0
4.71	-1.0
6.28	0.0

Built-in functions accept arrays

0.00	1.57	3.14	4.71	6.28
------	------	------	------	------



and return Arrays

0.00	1.00	0.00	-1.00	0.00
------	------	------	-------	------

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Does this assign to `y` the values $\sin(0^\circ), \sin(1^\circ), \dots, \sin(90^\circ)$?

```
x = linspace(0,pi/2,90);
y = sin(x);
```

A: yes B: no

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Element-by-element arithmetic operations on arrays
Also called "vectorized code"

```
x = linspace(-2,3,200);
y = sin(5*x).*exp(-x/2)./(1 + x.^2);
```

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Vectorized code
—a Matlab-specific feature See FVL 4.1 for list of arithmetic operations

- Code that perform element-by-element arithmetic/relational/logical operations on array operands in one step
- Scalar operation: $x + y$
where x, y are scalar variables
- Vectorized code:** $x + y$
where x, y are vectors of **same shape and length**

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Vectorized
element-by-element arithmetic operations on arrays

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Vectorized
element-by-element arithmetic operations between an array and a scalar

A dot (.) is necessary in front of these math operators

The dot in `.*`, `./`, `.^` not necessary but OK

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How many errors in the following statement given that `x = linspace(0,1,100)` ?

```
Y = (3*x .+ 1)/(1 + x^2)
```

A: 1 B: 2 C: 3 D: 4

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