

MATH 151A (Fall 2023)

Week 0: Introduction to MATLAB

Arrays

Construction

```
a = 1
```

```
a = 1
```

```
b = [1 2 3] % or [1, 2, 3]
```

```
b = 1×3  
    1     2     3
```

```
c = [a; a+2; a-2; 2*a; a/2]
```

```
c = 5×1  
    1.0000  
    3.0000  
   -1.0000  
    2.0000  
    0.5000
```

```
d = [1 2 3; 4 5 6]
```

```
d = 2×3  
    1     2     3  
    4     5     6
```

```
e = [c c+2 2*c; b]
```

```
e = 6×3  
    1.0000    3.0000    2.0000  
    3.0000    5.0000    6.0000  
   -1.0000    1.0000   -2.0000  
    2.0000    4.0000    4.0000  
    0.5000    2.5000    1.0000  
    1.0000    2.0000    3.0000
```

Indexing

```
c
```

```
c = 5×1  
    1.0000  
    3.0000  
   -1.0000  
    2.0000  
    0.5000
```

```
c(1)
```

```
ans = 1
```

```
c(3)
```

```
ans = -1
```

```
c(end)
```

```
ans = 0.5000
```

```
c(2:4)
```

```
ans = 3×1
      3
     -1
      2
```

```
c(1:2:end)
```

```
ans = 3×1
      1.0000
     -1.0000
      0.5000
```

```
e
```

```
e = 6×3
      1.0000      3.0000      2.0000
      3.0000      5.0000      6.0000
     -1.0000      1.0000     -2.0000
      2.0000      4.0000      4.0000
      0.5000      2.5000      1.0000
      1.0000      2.0000      3.0000
```

```
e(1, 2)
```

```
ans = 3
```

```
e(2:4, end)
```

```
ans = 3×1
      6
     -2
      4
```

```
e(2:2:end, :)
```

```
ans = 3×3
      3      5      6
      2      4      4
      1      2      3
```

```
c
```

```
c = 5×1
      1.0000
      3.0000
     -1.0000
      2.0000
      0.5000
```

```
c(2:3) = [1; 0];  
c
```

```
c = 5×1  
    1.0000  
    1.0000  
         0  
    2.0000  
    0.5000
```

Control flow

Conditionals

```
a = 5
```

```
a = 5
```

```
if a < 1  
    b = 1  
elseif a > 5  
    b = 5  
else  
    b = 3  
end
```

```
b = 3
```

Logical operations

```
a = 6
```

```
a = 6
```

```
if a < 0 || a > 3  
    b = 2  
else  
    b = 3  
end
```

```
b = 2
```

```
if a >= 0 && a < 5  
    c = 2  
else  
    c = 3  
end
```

```
c = 3
```

```
if a > 0 || ~(a < -5)  
    d = 2  
else
```

```
d = 3
end
```

```
d = 2
```

Loops

```
for i = 2:3:10
    i
end
```

```
i = 2
i = 5
i = 8
```

```
for j = 1:2:10
    j
    if j > 5
        break
    end
end
```

```
j = 1
j = 3
j = 5
j = 7
```

```
k = 1
```

```
k = 1
```

```
while k <= 5
    k = 2*k;
end
k
```

```
k = 8
```

Functions

```
square = @(x) x^2;
square(3)
```

```
ans = 9
```

```
square(square(3) + 1)
```

```
ans = 100
```

```
f = @(x, y) x + 2*y;
f(2, 3)
```

```
ans = 8
```

```
f([1; 2], [3; 4])
```

```
ans = 2×1  
      7  
     10
```

```
square_vec = @(x) x.^2;  
square_vec(3)
```

```
ans = 9
```

```
square_vec([1; 2; 3])
```

```
ans = 3×1  
      1  
      4  
      9
```

```
sin([0 pi/6 pi/4 pi/3 pi/2])
```

```
ans = 1×5  
      0      0.5000      0.7071      0.8660      1.0000
```

```
g = @(f, x) f(x/3);  
g(@cos, pi)
```

```
ans = 0.5000
```

Plots

Plotting $\sin(2\pi x)$ on $[0, 1]$.

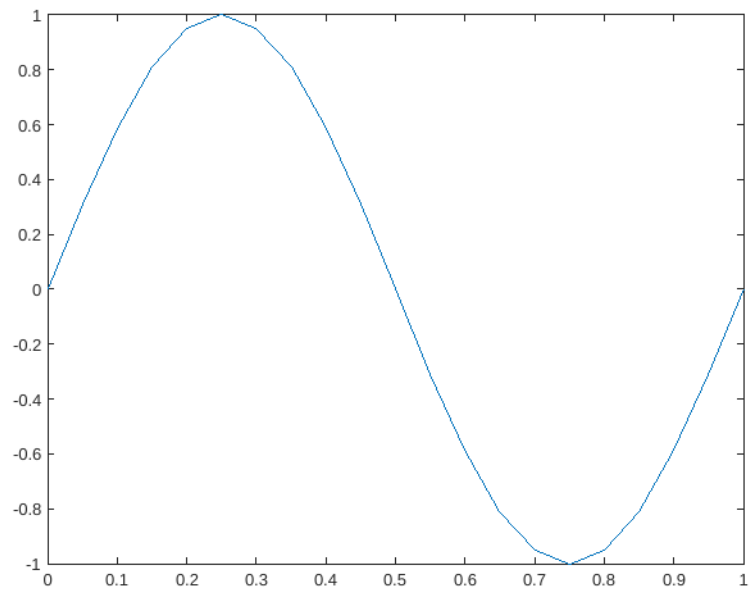
```
x = linspace(0, 1, 21)
```

```
x = 1×21  
      0      0.0500      0.1000      0.1500      0.2000      0.2500      0.3000      0.3500 ...
```

```
y = sin(2*pi*x)
```

```
y = 1×21  
      0      0.3090      0.5878      0.8090      0.9511      1.0000      0.9511      0.8090 ...
```

```
plot(x, y)
```



Exporting and publishing

For MATLAB live scripts:

```
export('week_00_intro.mlx', 'week_00_intro.pdf')
```

For MATLAB code and output:

```
publish('week_00_intro_code.m', 'pdf')
```