

# Matlab Array Basics and Miscellaneous

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## Compare Array Values That are Approximately Similar

What is the best way to compare floats for almost-equality in Python?

- `rel_tol` is a relative tolerance, it is multiplied by the greater of the magnitudes of the two arguments; as the values get larger, so does the allowed difference between them while still considering them equal.
- `abs_tol` is an absolute tolerance that is applied as-is in all cases. If the difference is less than either of those tolerances, the values are considered equal.

```
rel_tol=1e-09;  
abs_tol=0.0;  
if_is_close = @(a,b) (abs(a-b) <= max(rel_tol * max(abs(a), abs(b)), abs_tol));  
disp(['1 and 1, if_is_close:' num2str(if_is_close(1,1))]);
```

```
1 and 1, if_is_close:1
```

```
disp(['1e-300 and 1e-301, if_is_close:' num2str(if_is_close(1e-300,1e-301))]);
```

```
1e-300 and 1e-301, if_is_close:0
```

```
disp(['1+1e-9 and 1+1e-10, if_is_close:' num2str(if_is_close(1+1e-9,1+1e-10))]);
```

```
1+1e-9 and 1+1e-10, if_is_close:1
```

## Imaginary Number Examples

```
rng(123);  
  
% Imaginary array  
ar_img = rand([1,7]) + 1i*rand([1,7]);  
  
% Regular Array  
ar_real = rand([1,10]);  
  
% Combine arrays  
ar_full = [ar_real ar_img];  
ar_full = ar_full(randperm(length(ar_full))));  
disp(ar_full);
```

```
Columns 1 through 7
```

```
0.6344 + 0.0000i    0.1755 + 0.0000i    0.5316 + 0.0000i    0.2861 + 0.4809i    0.7380 + 0.0000i    0.1825 + 0.0000i
```

```
Columns 8 through 14
```

```
0.2269 + 0.3921i    0.7245 + 0.0000i    0.8494 + 0.0000i    0.6110 + 0.0000i    0.4231 + 0.4386i    0.9808 + 0.0597i
```

```
Columns 15 through 17
```

0.3980 + 0.0000i    0.5513 + 0.3432i    0.7195 + 0.7290i

```
% real index  
disp(~imag(ar_full));
```

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

```
% Get Real and not real Components  
disp(ar_full(imag(ar_full) == 0));
```

0.6344    0.1755    0.5316    0.7380    0.1825    0.7245    0.8494    0.6110    0.5318    0.3980

```
disp(ar_full(imag(ar_full) ~= 0));
```

0.2861 + 0.4809i    0.6965 + 0.6848i    0.2269 + 0.3921i    0.4231 + 0.4386i    0.9808 + 0.0597i    0.5513 + 0.3432i