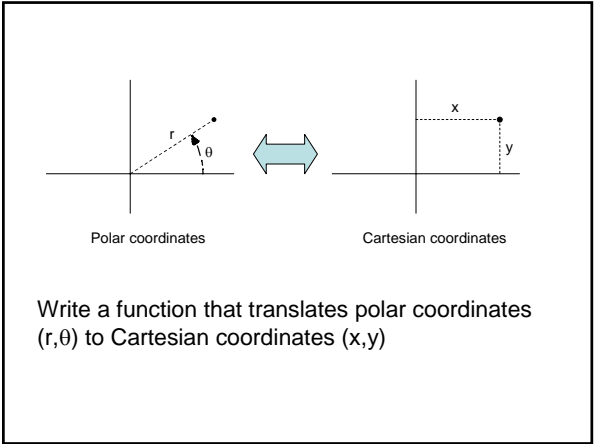


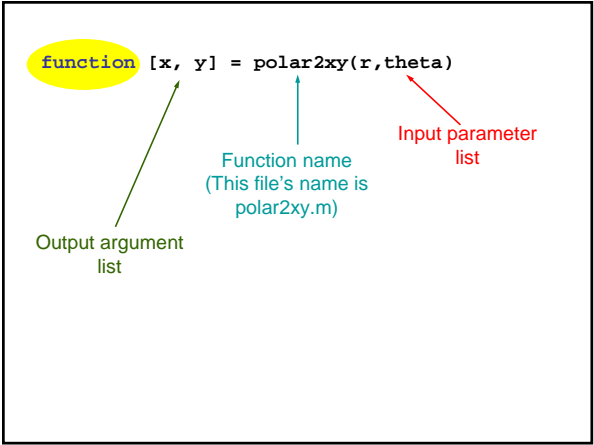
User-defined function



Write a function that translates polar coordinates (r, θ) to Cartesian coordinates (x, y)

```
function [x, y] = polar2xy(r, theta)
% Convert polar coordinates (r, theta) to
% Cartesian coordinates (x, y).
% theta is in degrees.

rads= theta*pi/180; % radian
x= r*cos(rads);
y= r*sin(rads);
```



Function header is the “contract” for how the function will be used (called)

You have this function:

```
function [x, y] = polar2xy(r, theta)
% Convert polar coordinates (r, theta) to
% Cartesian coordinates (x, y). Theta in degrees.
...
```

Code to call the above function:

```
% Convert polar (r1,t1) to Cartesian (x1,y1)
r1= 1; t1= 30;
[x1, y1]= polar2xy(r1, t1);
plot(x1, y1, '*')
...
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Code to call the above function:

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r1= 1; t1= 30;
[x1, y1]= polar2xy(r1, t1);
plot(x1, y1, '*')
...
```

General form of a user-defined function

```
function [out1, out2, ...]= functionName (in1, in2, ...)  
% 1-line comment to describe the function  
% Additional description of function
```

Executable code that at some point assigns values to output arguments out1, out2, ...

In the function's memory space:

- *in1, in2, ...* are defined when the function begins execution. Variables *in1, in2, ...* hold the function *arguments* (values) specified when the function is invoked (called).
- *out1, out2, ...* are not defined until the executable code in the function assigns values to them.

Comments in functions

- The block of **comments immediately below the function header** is printed whenever a user types **help functionName** in the Command Window
- The **1st line of this comment block** is searched whenever a user types **lookfor someWord** at the Command Window
- Every function should have a comment block immediately below the function header:
 - 1st line succinctly describes what the function does
 - Additional lines for more detail, if necessary

Subfunction—"helper function"

- There can be more than one function in an M-file
- **top** function is the main function and corresponds to the name of the file
- remaining functions are **subfunctions, accessible only by the top function**
- Each (sub)function in the file begins with a **function header**