

Homework #2

Math 4257/5257

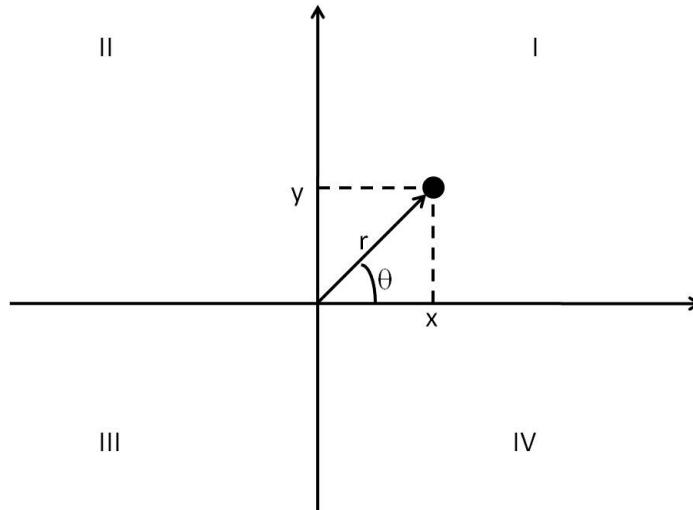
Due Midnight, September 24

- Create a script file that performs calls the appropriate .m files for the following problems. Publish the report as an html file. Zip all the .m files, figures and html file together and upload zip file to the dropbox in D2L.
1. (8 points) Create a function which evaluates whether a grade is passing (60 or above). If it is, display the comment 'passing grade'.
 2. (12 points) For a scalar, the built-in MATLAB command *sign* function returns the sign of its argument (either -1, 0, or 1). Develop an m-file to perform the same operation. Test it on several numbers, such as 2, -5, 3542, 0, -2000000.
 3. (15 points) Revise the m-file *freefalli.m* (found on D2L). The function should be revised to input 3 variables, t=time, m=mass, and cd = drag coefficient. If cd is not entered, assign cd = 0.27 which is the default drag coefficient (0.27 kg/m). The function should output one variable v=velocity. The code should check that both time and mass have been entered. The built-in function *nargin* (see help *nargin* in Matlab) determines the number of variables entered. If no variables are entered (i.e., nargin = 0), then output the error message ('Must enter time and mass') using the command

`error('Must enter time and mass')`

Use a similar statement giving an error if only time is entered, but not mass. The drag coefficient need not be entered. If it is entered, use the drag coefficient entered. If not, use the default drag coefficient (0.27). You may find either an *if/elseif/else* statement or a *switch* statement useful. Name the new file *freefallvelt.m*.

4. (15 points) Two distances are required to specify the location of a point relative to an origin in two-dimensional space (see figure below).
 - The horizontal and vertical distances (x, y) in Cartesian coordinates.
 - The radius and angle (r, θ) in polar coordinates.



It is relatively straight forward to compute Cartesian coordinates (x, y) on the basis of polar coordinates (r, θ) . The reverse process is not so simple. The radius can be computed by the formula

$$r = \sqrt{x^2 + y^2}$$

If the coordinates lie within the first and fourth coordinates (i.e., $x > 0$), then the simple formula can be used to compute θ

$$\theta = \tan^{-1}\left(\frac{y}{x}\right)$$

The difficulty arises for the other cases. The following table summarizes the possibilities:

x	y	θ
< 0	> 0	$\tan^{-1}(y/x) + \pi$
< 0	< 0	$\tan^{-1}(y/x) - \pi$
< 0	$= 0$	π
$= 0$	> 0	$\pi/2$
$= 0$	< 0	$-\pi/2$
$= 0$	$= 0$	0

Write a well-structured m-file to calculate r and θ as a function of x and y . Express the final results for θ in degrees. The program should input vectors x and y and display the results as a table with columns x , y , r , and θ . Test the program by evaluating the following cases:

x	y	r	θ
1	0		
1	1		
0	1		
-1	1		
-1	0		
-1	-1		
0	0		
0	-1		
1	-1		