ME2-HCPT Final Test Monday

Name:	CID number:

This is an open book exercise. You can **reuse/adapt/amend** any of your previous scripts, as long as you submit them.

Duration: 1h 20min

In your H drive create a folder *H:\ME2CPT\Final*.

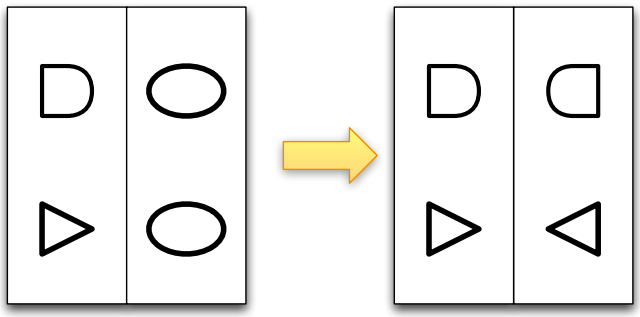
Comment, sensibly, all your scripts **[5]**

Write at least a main script for each task, and name the files taskA.m, taskB.m, taskC.m. If you need or wish, you can then subdivide the tasks and write any associated functions, at your convenience.

Task A [15]

The file *Obama.jpg* contains an image.

1. Read in the file and plot the image.
2. Mirror the left half part of the image on to the right half part.



3. Render the left half part all blue and the right half part all red.
4. Save the final image in the file *YesYouCan.jpg.*

Task B [25]

The file *coefficients.txt* contains three pairs of data: $(x_a, a), (x_b, b), (x_c, c)$.
The values of $a(x)$, $b(x)$, and $c(x)$, serve as coefficients for the ordinary differential equation:

$$a(x)\frac{d^2y}{dx^2} + b(x)y + c(x) = 0$$

Use this blank space to write anything you wish to submit

1. Fit the three sets of points individually with a fourth order polynomial.

2. Use the fitting polynomials to solve the differential equation in the range [0 : 0.01 : π], with boundary conditions $\left.\frac{dy}{dx}\right|_{x=0} = 3$ and $\left.\frac{dy}{dx}\right|_{x=\pi} = y$.

3. Save the values of *x* and *y* in the file *myoutput.txt*, in two columns format.

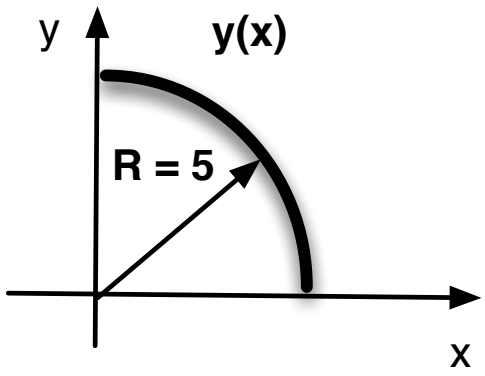
Task C [15]

1. Solve numerically, by using the trapezoidal scheme (with $dx = 0.01$), the integral:

$$I(x) = \int_0^x y(s)ds$$

in the range x = [0 : 0.01 : R].

The function y(x) is given in the figure:



2. Plot the numerical result $I(x)$ vs x in the given range.

Upload ALL your scripts and results on Blackboard.

Useful Matlab functions for this test:	
imread	- reads in data from image files
imwrite	- writes image data to a file
	- RGB: red, green, blue
dlmread	- reads multiple lines of numbers from a file
dlmwrite	- writes numerical data to a file
polyfit	- finds coefficients of polynomial to required degree
polyval	- evaluates a polynomial at specified points

Use this blank space to write anything you wish to submit