Due November 6

1. Write a SCRIPT FILE, called `midpoint.m`, that uses the Midpoint Rule rather than Left Sum or Right Sum Method to approximate $\int_a^b f(x)\,dx$. The script file should ask the user to input f (the string for the function, which you convert to a function using `inline`, a, b and n, which is the number of subintervals (rectangles) used for the approximation. Your program should check that n is a natural number, and that $a < b$. The file should output the approximation for the integral.

2. Do the same as above, except using the Trapezoidal Rule and call the script file `trap.m`.

3. Do the same as above, except using Simpson's Rule and call the script file `simpson.m`. IN ADDITION, your file should check that n an EVEN natural number.

4. Check the above programs by testing it on $f(x) = x^2$ for $a = 0$, $b = 1$ and $n = 2$. Show your work on paper what answer (by hand) each approximation should be.

5. Try out your programs by approximating the following integrals for the following n-values. Use a table of integrals or your calculus book to find the EXACT VALUE of the integral is to compare the accuracy, showing your work on paper (a few, not many, details).

   Complete the following table:

Function, n	exact value	approx to 6 decimal places	midpoint	trapezoid	simpson
$\int_0^1 \frac{1}{25+x^2}\,dx,\ n=4$					
$\int_0^1 \frac{1}{25+x^2}\,dx,\ n=10$					
$\int_{\frac{\pi}{2}}^{\pi} e^{2x}\sin(3x)\,dx\ n=4$					
$\int_{\frac{\pi}{2}}^{\pi} e^{2x}\sin(3x)\,dx\ n=10$					
$\int_0^1 \sin^2(\pi x)\,dx\ n=4$					
$\int_0^1 \sin^2(\pi x)\,dx\ n=10$					

EXTRA CREDIT (5 points): To four decimal places, what should

$$\int_{-1}^{1} \frac{1}{\sqrt{2\pi}} e^{-x^2/2}\,dx = ?$$

Hint: think statistics. Which of your three functions above yields a better approximation?

To turn in:

- your three m-files E-MAILED TO ME with the subject of the email being MATLAB HW7,
- your work and answers to #3 and 4 (turned in on paper in class)