ECOR 2606 Lab Test #5 Practice Material

1/. Find the area of the region bounded by the following two functions:

$$f_1(x) = 20\sin(x)$$

$$f_2(x) = 2x^2 - 3x + 6$$

The first function assumes that *x* is in radians.

2/. (from text example 16.5) The table below tabulates the velocities of a car.

t (s)	0	20	40	56	68	80	84	96	104	110
v (km/hr)	0	20	20	38	80	80	100	100	125	125

How far will the car travel between *t* = 0 and *t* = 110 seconds?

As discussed in the text, this data is best approximated using piecewise cubic Hermite interpolation. Find the spline, generate 121 evenly spaced data points, and then find the required answer using i) trapezoidal integration and ii) Simpson's 1/3 rule.

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Note: Where Romberg integration is required, use Matlab to do the necessary trapezoidal integration (i.e. to generate the left column of the pyramid).

3/. (text 18.1) Use Romberg integration to evaluate

$$I = \int_1^2 \left(2x + \frac{3}{x}\right)^2 dx$$

Keep going until the approximate relative error is less than 0.5% (i.e. until the approximate relative error is less than 0.005). Calculate the integral analytically and check that the approximate relative error is less than the actual relative error (as we assume it will always will be).

4/. (text 18.3) Evaluate the following integral with (a) Romberg integration (relative error = 0.5%), (b) two point Gaussian quadrature, and (c) Matlab's *integral* functions.

$$I = \int_1^4 xe^x dx$$

5/. (text 18.4) There is no closed form solution for the error function

$$erf(z) = \frac{2}{\sqrt{\pi}} \int_0^z e^{-x^2} dx$$

Use two point and three point Gaussian quadrature to estimate erf(1.5). Check your results by using Matlab's built-in *erf* function.