

Here are some sample questions from old tests. Some topics that we covered are not represented by these questions, but are still fair game.

1. What are: Polynomial Interpolations, Splines and Least Squares approximations? How do you get them from MATLAB?
2. What is a polynomial interpolation? How do you get one in MATLAB?
3. Given a data set represented by vectors  $\mathbf{x}$  and  $\mathbf{y}$ , describe how you would use **Matlab** to get a Least Squares Approximation, Polynomial Interpolation and Spline Interpolation?
4. What are the main *differences* in the uses of: Polynomial Interpolation, Splines and Least Squares Fitting?
5. Discuss uses of Polynomial Interpolation, Splines and Least Squares Interpolations.
6. Estimate the integral  $\int_0^\pi \sin x \, dx$  using  $L_4$ ,  $R_4$  and  $T_4$ . Calculate the exact value and the percentage errors of each of the approximations.
7. Estimate the integral  $\int_0^{16} \sqrt{x} \, dx$  using  $L_4$ ,  $R_4$ ,  $T_4$  and  $S_4$ . Calculate the exact value and the percentage errors of each of the approximations.
8. Approximate the integral  $\int_0^\pi \sin x \, dx$  using  $M_4$  and  $S_4$ . Which do you expect to be more accurate?
9. Write a MATLAB program to do the midpoint method for integration. Let the inputs be the function  $f$ , the endpoints  $a$ ,  $b$  and the number of subintervals  $n$ .
10. Write a MATLAB function program to do the trapezoid method for integration. Let the inputs be the function  $f$ , the endpoints  $a$ ,  $b$  and the number of subintervals  $n$ .
11. Write a MATLAB function program to do the Trapezoid Rule for integration of data. Let the inputs be vectors  $x$  and  $y$ , where it is assumed that  $y$  is a function of  $x$  and  $x$  is not necessarily evenly spaced.
12. Describe methods for approximating double integrals.
13. Describe and give formulas for 2 methods to approximate double integrals based on triangles.