Note: The material in this lab, particularly the commands** solve **and** fsolve**, will be used repeatedly throughout the remainder of the semester.

1. Find the intervals in which $p(t) > q(t)$. Do it twice, first using the Context Menu, and second using the *solve* command. Then give the exact solution in standard interval notation.

$$p(t) = t^4 + 4t^3 + 7t^2 - 3t - 4 \text{ and } q(t) = 10 + 2t - 4t^2 - 3t^3$$

2. Find the x-coordinates of all points of intersection between the functions g and h. Use the *fsolve* command to solve this problem. Any approximations should be to the nearest ten-thousandth. Check if solutions are reasonable by using the *eval* command. Give your answer in a sentence.

$$g(x) = x^3 - 2x^2 + 3x + 1 \text{ and } h(x) = 5\sin 2x$$

3. Consider the equation

$$2x^3 - 5x + 8 = 3 + 5x - x^2.$$

   (a) Find all solutions to the equation using the *solve* command.
   (b) Use the context menu to select the first entry and approximate it to both five digits and to twenty digits.
   (c) Use the *fsolve* command to solve the equation.
   (d) Comment on the above results. Speculate on what you think is going on.

4. (a) Solve the equation $\dfrac{x^2 - 5x + 6}{x^2 - 4} = -\dfrac{1}{4}$ exactly as written.
   (b) Simplify the equation above before you solve it, and solve the simplified version.
   (c) Comment on the above results. What is the solution to the original equation?

5. Find the roots of the function f in the given interval. Give the exact answers if possible and any approximate solutions should be to the nearest 0.0001.

$$f(x) = \left(x^2 + 2x - 5\right)\sin\left(x^2 + 2x - 2\right) \text{ for } x \in [0, 2.5]$$

6. The distance an oscillating piston, in centimeters, is from the top of its encasement is given by a function $L(t)$ where t represents time in seconds. Find when the piston is within seven centimeters of the top of its encasement during the first ten seconds. If reasonable, find the exact values. Any approximations should be to the nearest thousandth.

$$L(t) = 10 + 6\sin 2t$$