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 then using the *solve* command. Are the solutions the same? Write the exact solution in standard interval notation. Based on the graph, are the results reasonable?

$$p(t) = t^4 - 2t^2 - 3t - 2 \text{ and } q(t) = t^3 + 3t^2 - 9t - 2$$

2. Find all points of intersection between the functions g and h. If possible, find *exact values*. Any approximations should be to the nearest ten-thousandth. Check if solutions are reasonable by using the *eval* command. State the solutions in a complete sentence

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

3. Consider the equation

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

   (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 ten digits.

   (c) Use the *fsolve* command to solve the equation.

   (d) Load the RealDomain package, then follow the directions for parts (a) and (b).

   (e) Comment on the above results. Speculate on what you think is going on.

4. (a) Solve the equation $\dfrac{x^2 + 2x - 3}{x^2 + x - 2} = 2$ 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 exact solutions if possible. Otherwise, give numerical apporximations. Any approximate solutions should be to the nearest 0.0001.

$$f(x) = \left(x^2 + 5x - 1\right)\cos\left(x^2 + 3x - 2\right) \text{ for } x \in [0, 2]$$

6. The distance, in centimeters, an oscillating piston 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 four centimeters of the top of its encasement during the first twelve seconds. If reasonable, find exact values. Any approximations should be to the nearest thousandth.

$$L(t) = 8 + 5\cos\frac{5}{3}t$$