Assignment 3: Solving Equations (0.4) **Name:__________________**
Please provide a handwritten response.

1a. One way to solve algebraic equations in *Derive* is to use the solve icon from the shortcut menu. To find the zeroes of $f(x) = x^2 - 3x + 2$, **Author** and highlight x^2 - 3x + 2. Then click and select *x* as the solution **variable**, algebraically as the solution **method**, and click **OK**. *Derive* will show "SOLVE(x^2 - 3·x + 2, x)." *Derive* assumes an equation is equal to zero if we do not specify otherwise. Highlight this and simplify by clicking . Record the result below.

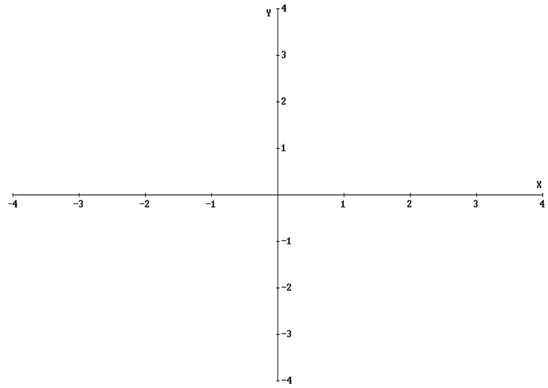
1b. The **Solve** command, , can be used to solve more complicated equations. **Author** and solve for the zeroes of $f(x) = x^3 - x^2 - 2x + 2$. Record the result below.

1c. Did *Derive* give a decimal answer in **1b**? We can obtain a decimal answer by highlighting either the "SOLVE" expression OR the solution from **1b**, then clicking to approximate the solution. Do this and record the result below.

1d. An alternate way of solving expressions is to highlight the equation we want to solve, click , and specify the variable we want. Instead of clicking **OK**, click **Simplify**. *Derive* will not show the "SOLVE" command on the screen; *Derive* simply gives the final simplified result. Occasionally, however, we want to see what we are solving, instead of simply the answer. Find the solutions of $x^3 - x^2 = 3x - 2$ using the alternate method and record the results below.

2a. Sometimes is unable to solve an equation algebraically. **Author** and solve $\cos(x) = x^2 - 1$ as above. Record the output from *Derive* below; did we get an answer?

2b. Try to approximate the solution graphically by plotting $f(x) = \cos(x)$ and $g(x) = x^2 - 1$. Sketch the result on the axes at right. Where, approximately, do these functions intersect?



2c. We can use *Derive* to solve an equation numerically only if we are able to obtain intervals that contain the solutions. From our graph in **2b**, it seems that there is an intersection in the interval $(-2,-1)$ and another one in the interval $(1,2)$. Highlight $\cos(x) = x^2 - 1$ and select . Pick *x* as the **variable** and numerically as the solution **method**. Click **bounds** and specify -2 as the **lower** and -1 as the **upper solution bound**. To see the results, click **OK** and ; Record the result below. Similarly, solve for the solution in the interval $(1,2)$ and record the result below.

2d. Now change parts **b** and **c** above to solve the equation $\cos(x) = x^2 - 5$. Remember to change the intervals to reflect where solutions are known to exist. Record the results below.

3a. *Derive* can perform many other algebraic operations. For example, *Derive* can expand expressions. To expand $(x+y)^7$, **Author** (x+y)^7 and select **Simplify→Expand** from the menu at top. Leave the default selections as they appear and click **Expand** from the bottom of the open window. Record the result below.

3b. Likewise, *Derive* can factor expressions. To factor $x^4 - 3x^2 + 2$, **Author** the expression and select **Simplify → Factor**. Leave the default selections as they appear and click **Factor** at the bottom. Record the result below.