

**Assignment 3: Solving Equations (0.1&2)**  
**Please provide a handwritten response.**

Name \_\_\_\_\_

**1a.** One way to solve algebraic equations in *Maple* is to use the **solve** command. For example, we can find the zeros of  $f(x) = x^2 - 3x + 2$  by executing the command **f:=x->x^2-3\*x+2;** followed by

**solve (f (x) =0 , x) ;**

Record the result below.

**1b.** The **solve** command can be used on more complicated equations. Execute the command

**f:=x->x^3-x^2-2\*x+2;**

followed by **solve (f (x) =0 , x) ;** to find the zeros of  $f(x) = x^3 - x^2 - 2x + 2$ , and record the result below.

**1c.** Once again, *Maple* did not give a completely decimal answer. We can achieve a decimal answer by using the **fsolve** command. Execute the command

**fsolve (f (x) =0 , x) ;**

and record the result below.

**2a.** Sometimes the **solve** command is unable to solve an equation algebraically; in this case we can try to solve it numerically, as mentioned in Example 2.7 of the text, using the **fsolve** command. As an example, execute the command

**solve (cos (x) =x^2-1 , x) ;**

to try to solve the equation  $\cos(x) = x^2 - 1$ . (We will learn how to use *Maple* with trigonometric functions in general later.) *Maple* could not give an algebraic answer. Now try the command

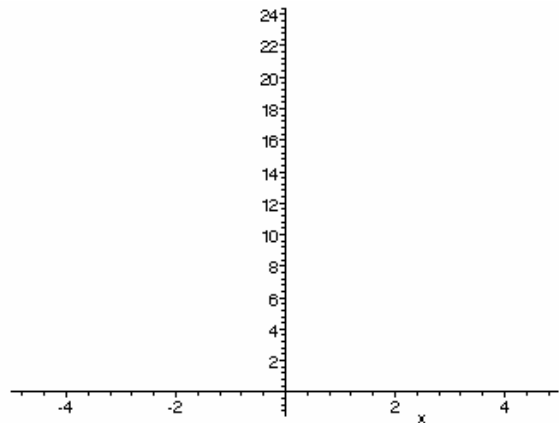
**fsolve (cos (x) =x^2-1 , x) ;**

Record the output below; did we get our answer?

**2b.** To find all the roots, we will begin with a graph to show approximately where the solution(s), if any, might be found. Execute the command

```
plot ( [cos (x) , x^2-1] , x=-5..5 ) ;
```

to plot each side of our equation as a function of  $x$  over the domain  $-5 \leq x \leq 5$ , and sketch the result on the axes at right. It seems from this graph that there are solutions at roughly  $x = \pm 1$ , and we can now use this information in the **fsolve** command.



**2c.** Execute the command

```
fsolve (cos (x) =x^2-1 , x=1) ;
```

to find an accurate value of the solution of the equation near  $x = 1$ , and likewise execute

```
fsolve (cos (x) =x^2-1 , x=-1) ;
```

to do the same near  $x = -1$ ; record the results below.

**2d.** Now change parts **b** and **c** so as to solve the equation  $\cos x = x^2 - 5$  instead; remember to replace the **1** in **x=1** to an appropriate starting value suggested by your graph, and similarly for **x=-1**. Record the solutions below.

**3a.** *Maple* can perform many other algebraic operations. For example, the **expand** command expands algebraic expressions; execute the command **expand ( (x+y) ^7 )**; to expand the binomial expression  $(x + y)^7$ , and record the result below.

**3b.** Likewise the **factor** command factors expressions; execute the command

```
factor (x^4-3*x^2+2) ;
```

to find the factors of  $x^4 - 3x^2 + 2$ , and record the result below.