

Elementary Algebra
(number4.mws)

In this exercise we study the basic properties of polynomials and rational functions. Some relevant MAPLE commands will be `factor`, `expand`, `solve`, `fsolve`, `denom`, `numer`, `simplify`, `subs`,

The first thing we need to learn is how to define a function. There are two ways, each with its own advantages and disadvantages. One way is as a symbolic statement as below:

```
[ > p1 := x^2 - 1
```

The other is as an operation as below:

```
[ > p2 := x -> x^2 - 1
```

Try the following command sequences to see some of the differences in how MAPLE treats these two definitions differently. As always record your observations and comments on the worksheet in text mode.

```
[ > p1;  
[ > p2;  
[ > p2(x);  
[ > p2(t-3);  
[ > p2(u^3-u^2+2);
```

This works just like we expect substitution to work because `p2` is an operation on whatever is in the (). However since `p1` is a symbolic expression we have some difficulties with substituting into it directly. Try the following command sequences.

```
[ > p1(x);  
[ > p1(t-3);  
[ > p1(u^3-u^2+2);
```

Notice the extra `x` in front. This is curious and not very reassuring. To substitute into a symbolic expression we must use the `subs` command.

```
[ > subs(x=t-3, p1);  
[ > subs(x=6, p1);  
[ > p2(6);
```

Now let's do some simple operations on this polynomial:

```
[ > factor(p1);  
[ > factor(p2);  
[ > factor(p2(x));  
[ > expand(%);  
[ >  
[ > solve(%);
```