**Features and Polynomial Regression**

We can improve our features and the form of our hypothesis function in a couple different ways.

We can **combine** multiple features into one. For example, we can combine *x*1 and *x*2 into a new feature *x*3 by taking *x*1⋅ *x*2.

**Polynomial Regression**

Our hypothesis function need not be linear (a straight line) if that does not fit the data well.

We can **change the behavior or curve** of our hypothesis function by making it a quadratic, cubic or square root function (or any other form).

For example, if our hypothesis function is *hθ*(*x*) = *θ*0 + *θ*1*x*1 then we can create additional features based on *x*1, to get the quadratic function *hθ*(*x*) = *θ*0 + *θ*1*x*1 + *θ*2*x*12 or the cubic function *hθ*(*x*) = *θ*0 + *θ*1*x*1 + *θ*2*x*12 + *θ*3*x*13

In the cubic version, we have created new features *x*2 and *x*3 where *x*2 = *x*12 and *x*3 = *x*13.

To make it a square root function, we could do: *hθ*(*x*) = *θ*0 + *θ*1*x*1 + *θ*2√*x*1

One important thing to keep in mind is, if you choose your features this way then feature scaling becomes very important.

eg. if *x*1 has range 1 - 1000 then range of *x*12 becomes 1 - 1000000 and that of *x*13 becomes 1 - 1000000000