**FINDING WHERE THE GRADIENT OF A CURVE IS ZERO.**

Maximum and minimum points max

occur when the gradient is zero.

We must practise doing this process.

At this stage we will not worry about

proving whether they are max or min points.

min

Find the *x* values of the points where

the gradient is zero.

**EXAMPLE**

**1*. Curve y = x3 – 3x2 – 9x + 4***

***Grad y ′= 3x2 – 6x – 9***

***= 3(x2 – 2x – 3)***

***= 3(x – 3)(x + 1)***

***So Grad = 0 if x = 3 or – 1***

*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*2. Curve y = x2 – 10x + 11*

*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*3. Curve y = x3 + 6x2 – 15x + 7*

*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*4. Curve y = (x – 3)(x – 11)*

*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*5. Curve y = 3x(12 – x)*

*6. Curve y = x3 – x2 – x + 6*

*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*7. Curve y = x3 + 2x2 + x – 5*

*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*8. Curve y = 4x3 – 24x2 + 36x + 3*

*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*9. Curve y = x(x – 12)2*

*= x(x – 12) (x – 12)*

*=*