**EXPLANATION OF THE SECOND DERIVATIVE TEST.**

***y***

***MAX***

***y = x(x – 3)2***

*INFL*

*= x3 – 6x2 + 9x* ***MIN***

(cubic curve)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1 2 3 4

***y ′ = 3x2 – 12x + 9 y*′**

*= 3(x2 – 4x + 3)*

*= 3(x – 1)(x – 3)* 1 2 3 4

(parabola)

***y ′′ > 0***

***if the curve is***

***concave UP***

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  ***y* ′′**

***y ′′ = 6x – 12***

(line graph)

***y ′′<* 0**

***if the curve is***

***concave DOWN*.**

1 2 3 4

***y* ′′ = 0**

***at the point of***

***inflection.***

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**NOTICE THESE THREE POINTS:**

**When the cubic has a MAXIMUM the 2nd derivative is a NEGATIVE number.**

**When the cubic has a MINIMUM the 2nd derivative is a POSITIVE number.**

**When the cubic has an INFLECTION point the 2nd derivative is ZERO.**