**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.***

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**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.**