DERIVATIVE TEST FOR A POINT OF INFLECTION.

THEOREM:

If the graph of $f(x)$ has an inflection point at x_0 , and $f''(x_0)$ exists in an open interval containing x_0 , and f'' is continuous at x_0,
then $f''(x_0) = 0$

However, the converse of this is not true - i.e. it`s true that if x_0 is an inflection point, then $f''(x_0) = 0$

it`s not true (generally) that if $f''(x_0) = 0$ then $f(x_0)$ is an inflection point.

Here is how you can tell a point is DEFINITELY an inflection point:

If $f''(x_0) = 0$ and $f^{(n+1)}(x_0) \neq 0$ for some n=2k, k $\in \mathbb{Z}$

then, there is an inflection point at $(x_0, f(x_0))$

OR:

Let $f(x)$ be a real valued differentiable function, on an interval within $\mathbb{R}$, an n (1) an integer.

If $f'(c) = f''(c) = f'''(c) = \ldots \boldsymbol{f^{(n)}(c)} = 0$

and $f^{\{n+1)}(c) \neq 0$, then either:

1) n is odd and:

$f^{(n+1)}(c) < 0 \Rightarrow \boldsymbol{x = c}$ is a relative maximum.

or

$f^{(n+1)}(c) > 0 \Rightarrow \boldsymbol{x = c}$ is a relative minimum.

OR:

2) n is even, and:

$f^{(n+1)}(c) < 0 \Rightarrow \boldsymbol{x = c}$ is a stricly decreasing point of inflection.

or

$f^{(n+1)}(c) > 0 \Rightarrow \boldsymbol{x = c}$ is a stricly increasing point of inflection.