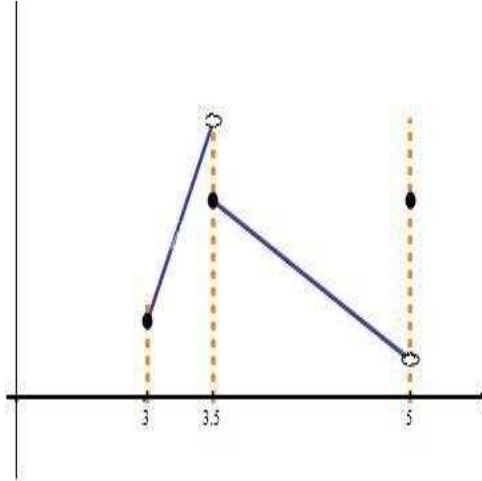**Example** In the graph below the function is defined on the interval $[0, 5]$. And f has no absolute maximum or minimum on this interval. It has a local minimum at $x = 3$ and a local maximum at $x = 5$. The point $x = 3.5$ is neither a local maximum nor a local minimum.

Looking at these last two examples a good question to ask now is: How might we find and identify absolute maxima and minima? As in the last example, a function might not even have an absolute maximum or minimum. So when will we know we can find extreme values (i.e., absolute maxima and minima)? In comes the

Extreme Value Theorem If $f(x)$ is a continuous function on $[a, b]$, then $f(x)$ has an absolute maximum c and an absolute minimum d on this interval.

<u>Caution</u> Just like the Intermediate value theorem or Mean Value Theorem, if we ever want to use the Extreme value theorem to conclude a function has an absolute maximum or minimum, it is very important that the hypotheses of the extreme value theorem are satisfied. Check out the two examples below :