SOME SUBTLY DIFFERENT MAX/MIN PROBLEMS

Let $f(x) = x^3 - 12x + 6$ and consider the following max/min problems.

(1) Determine the maximum and minimum values of f on the interval $[0, 3]$.

(2) Determine where f takes its maximum and minimum values on the interval $[0, 3]$.

(3) Determine the points on the graph of f corresponding to its maximum and minimum values on the interval $[0, 3]$.

(4) Determine the local maximum and minimum values of f on the interval $[0, 3]$.

(5) Determine where f takes its local maximum and minimum values on the interval $[0, 3]$.

(6) Determine the points on the graph of f corresponding to its local maximum and minimum values on the interval $[0, 3]$.

Many students treat these as if they were the same. They are not!

Answers

(1) The maximum value is 6 and the minimum value is -10.

(2) The maximum value occurs at 0 and the minimum value occurs at 2.

(3) The point on the graph corresponding to the maximum is $(0, 6)$; the point corresponding to the minimum is $(2, -10)$.

(4) The local maximum values are 6 and -3; the local minimum value is -10.

(5) The local maximum values occur at 0 and 3; the local minimum value occurs at 2.

(6) The points on the graph corresponding to the local maxima are $(0, 6)$ and $(3, -3)$; the point corresponding to the local minimum is $(2, -10)$.

The computations are the same for all of them. Do them, and see why the answers are different.

Moral: Read the problem carefully and be sure to answer what it asks.

Is this being picky? Yes! Is it being too picky? No! Every subject has concepts that differ only in subtle details. Real knowledge involves understanding and appreciating those subtle differences.