The absolute maximum of a function is the largest y-value that the function ever attains. The absolute minimum of a function is the smallest y-value that the function ever reaches. An absolute extreme value is either an absolute maximum or absolute minimum. For a given function both absolute max and min values may exist or you may have one or the other, or neither.

Question? Under what conditions are absolute extrema guaranteed and how do we find them.
Answer: If a function is continuous on a closed interval [a,b] the function is guaranteed both an absolute maximum and an absolute minimum on that interval. Furthermore, these extreme values will occur either at a critical value in the interval or at an endpoint of the interval.
To find the extrema on a closed interval:

1) Find the critical values in the interval.
2) Plug those critical values and the endpoints into the original function.
3) The largest y-value you get is the max, the smallest y-value is the minimum.

Note: You only use critical values that are in the interval in question. If there are others, you ignore them.

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Optimization Applications on intervals:

1) Read the problem and draw a picture if possible. Label the unknowns with variables.
2) Write down any given information in terms of your variables.
3) Formulate an equation representing the quantity that you wish to maximize or minimize.
4) Use the information from step 2 to rewrite the above function in terms of a single variable.
5) Take the derivative of what is to be optimized and find the critical values.
6) If the function has only one critical value in the interval use the 2^{nd} derivative test to verify that the function is maximized or minimized there. If the interval is closed you can evaluate the function at all critical values and at the endpoints of the interval to determine the maximum and minimum values.

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