Finding Extreme Values On A Closed Interval

Do Now:
Suppose you were asked to find the student in this school who, at this point in time, has the most money on him or her. Write below a method that would be efficient and quick.

To find the absolute maxima and minima of a function f on a closed interval $[a, b]$:

1. Find all critical values of f. (Set both numerator and denominator of $f' = 0$ and solve.)
2. Evaluate f at each critical number in (a, b)
3. Evaluate f at each endpoint of $[a, b]$. That is, find $f(a)$ and $f(b)$.
4. The smallest of these values is the absolute minimum; the largest of these values is the absolute maximum.

Tip: Note the difference between ***where*** the absolute maximum or minimum occurs and ***what*** the absolute maximum or minimum is. ***Where*** is the x-value. ***What*** is the y-value.

Extreme Value Theorem

For a continuous function on a closed interval $[a, b]$, there will be an absolute maximum and an absolute minimum and these will occur at either critical points or endpoints.

Find the coordinates of the absolute minimum and absolute maximum of the following functions on the given interval.

1. $f(x) = 3x^4 + 4x^3$ $[-2, 1]$

2. $f(x) = 3x^4 + 4x^3$ $(-2, 1)$

3. $f(x) = 2x^3 - 3x^2 - 12x$ $[-2, 4]$

4. $f(x) = x^{\frac{2}{3}}(20 - x)$ $[-1, 20]$