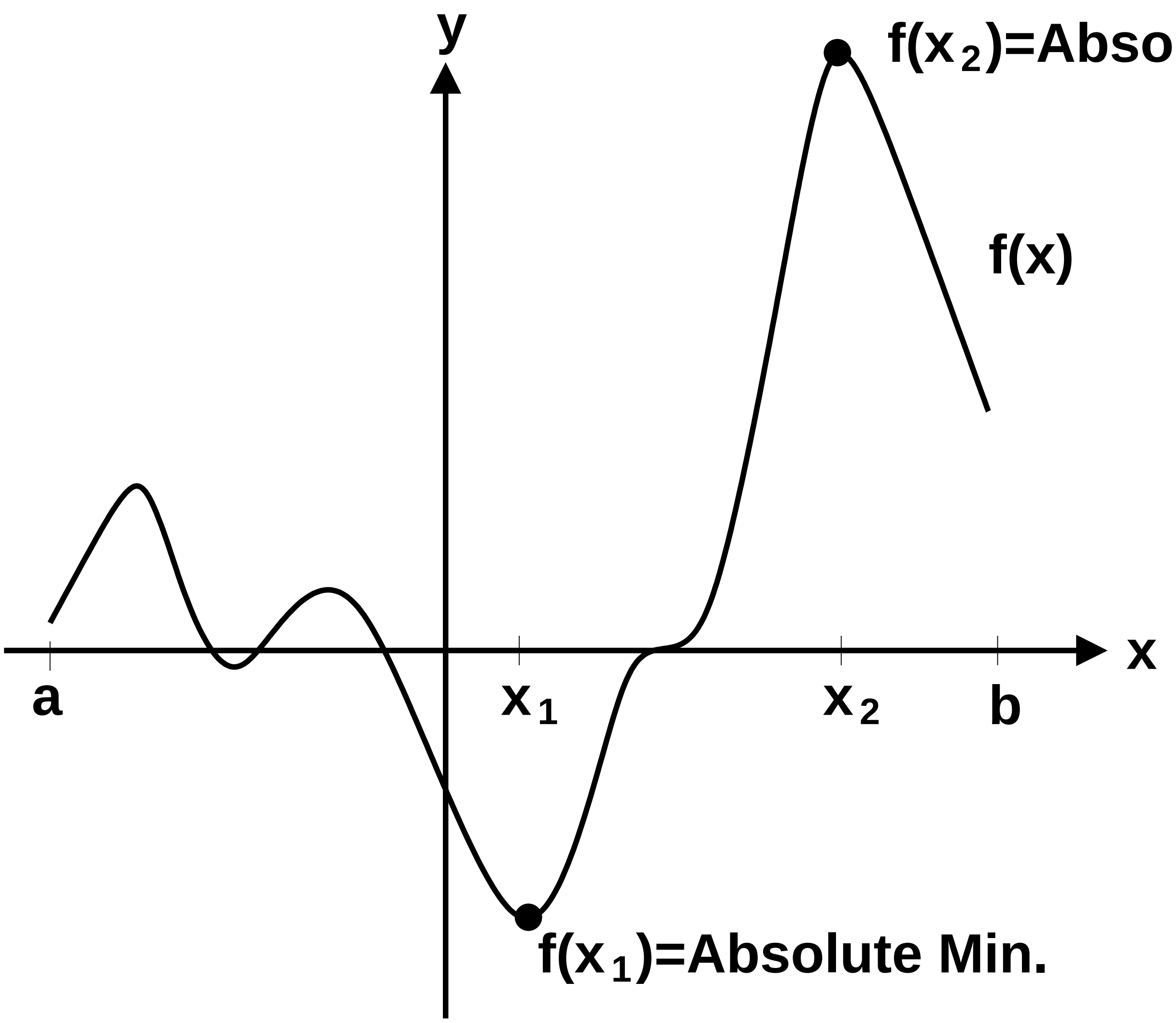
Absolute Max. & Min. of a Function on a Closed Interval $a \leq x \leq b$:



Procedure for Finding the Absolute Max. $\&$ Min. of a Continuous Function f on a Closed Interval $a \leq x \leq b$:

Step 1: Find the critical numbers of $f(x)$ in the interval $a < x < b$.

Step 2: Evaluate $f(x)$ at the critical numbers found in Step 1 and at the endpoints ($x = a$ and $x = b$).

Step 3: The largest and smallest values in Step 2 are the absolute max. and absolute min. of $f(x)$ on $a \leq x \leq b$.

Example: Find the absolute maximum and minimum of $f(x) = (x^2 - 9)^3$ on the interval $-4 \leq x \leq 1$. Where are they attained?

Note that $f(x)$ is continuous on the closed interval $-4 \leq x \leq 1$.

Step 1: Calculate $f'(x) = 3 \cdot (x^2 - 9)^2 \cdot 2x = 6x((x+3)(x-3))^2$.

$f'(x)$ is defined for all x.

$f'(x) = 0$ when $x = 0$, $x = -3$, or $x = 3$.

3 doesn't lie in the interval $-4 < x < 1$, so the critical numbers are: $\underline{x = 0}$ and $\underline{x = -3}$.

Step 2:

x	$f(x)$			
0	$f(0)$	$=$	-729	abs. min.
-3	$f(-3)$	$=$	0	
-4	$f(-4)$	$=$	343	abs. max.
1	$f(1)$	$=$	-512	

Step 3:

Absolute max. is 343 and is attained at $x = -4$.

Absolute min. is -729 and is attained at $x = 0$.