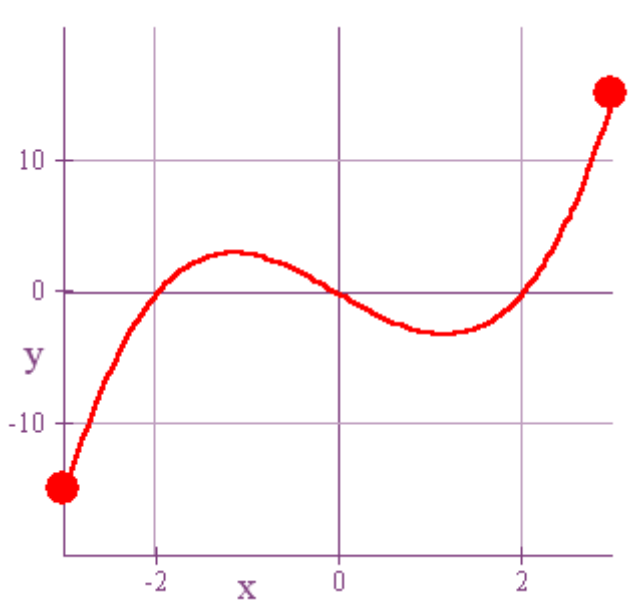
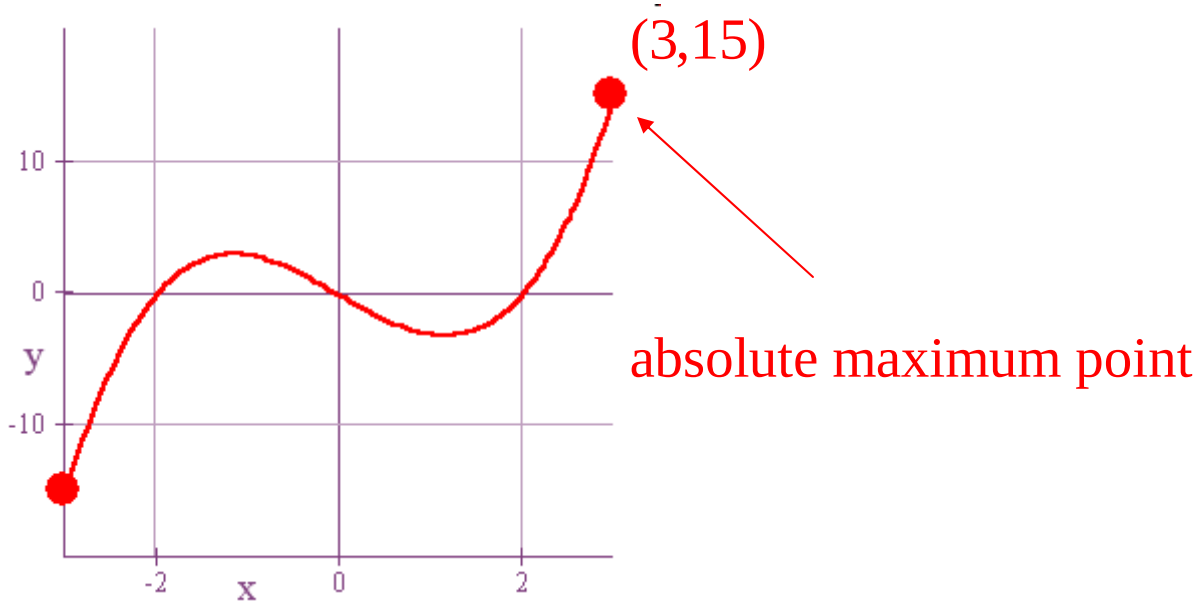
ABSOLUTE EXTREMA



$$y = x^3 - 4x$$

$$-3 \le x \le 3$$

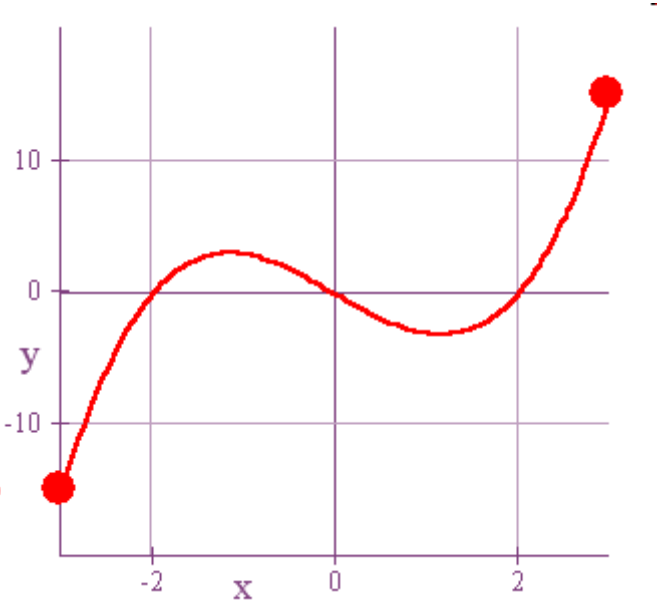
A value is an *absolute maximum* for a function if it is greater than or equal to any other value in the range of the function.



$$y = x^3 - 4x$$

$$-3 \le x \le 3$$

A value is an *absolute minimum* for a function if it is less than or equal to any other value in the range of the function.



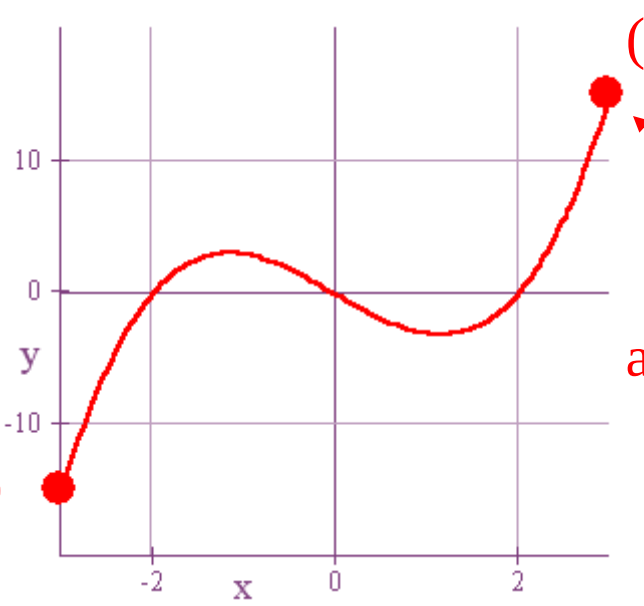
$(-3, -15)$

absolute minimum point

$$y = x^3 - 4x$$

$$-3 \le x \le 3$$

If a function is continuous on a closed interval, then it will have both an *absolute maximum* and an *absolute minimum*.



(3,15)

absolute maximum point

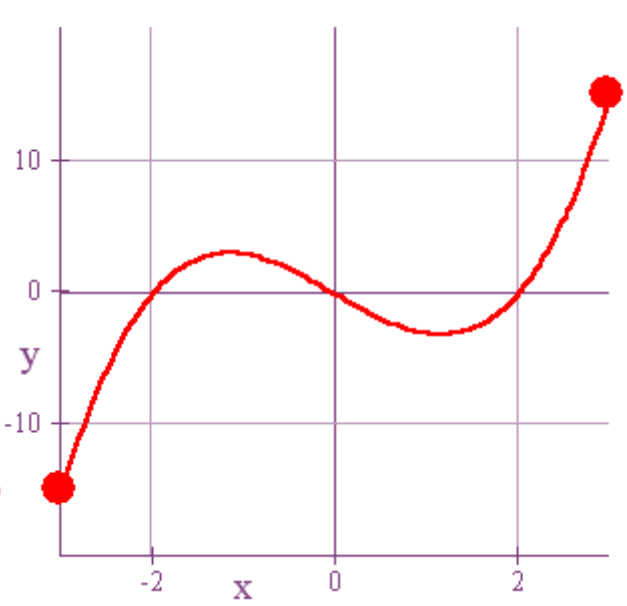
(−3,−15)

absolute minimum point

$$y = x^3 - 4x$$

$$-3 \le x \le 3$$

To find the *absolute extrema* over a closed interval, find any critical points in the open interval, and then find the values of the function at the endpoints of the interval.



(3,15)

absolute maximum point

(−3,−15)

absolute minimum point

$$y = x^3 - 4x$$

$$-3 \le x \le 3$$

EXAMPLE: Find the absolute extrema for $f(x) = x^3 - 3x$ on the interval $[0, 2]$.

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$f'(x) = 3x^2 - 3$

$3x^2 - 3 = 0 \Rightarrow x = 1$

$f(0) = 0$

$f(1) = -2$ absolute minimum

$f(2) = 2$ absolute maximum