TOPIC: INTRO TO EXTREMA

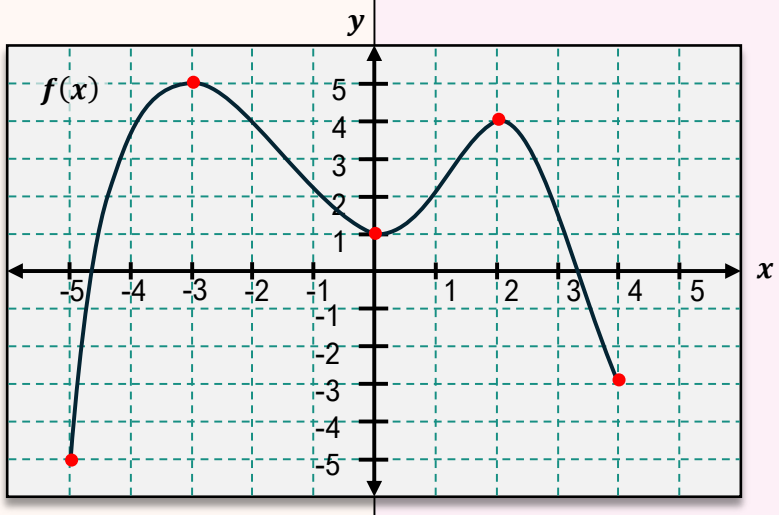
Finding Extrema Graphically

◆ Recall: Graphically, extrema (*maxima* & *minima*) occur at the *highest* & *lowest* points of a function.

► Extrema may be **global** (_____ function), **local** (_____ of function), or **both**.

EXAMPLE Determine whether each labeled point is a global max/min, a local max/min, or none of these.

Global (Absolute) Extrema	Local (Relative) Extrema
For $x = c\ldots$	
Global maximum	**Local maximum**
$f(c)\ [\geq \mid \leq]\ f(x)$	$f(c)\ [\geq \mid \leq]\ f(x)$
for _____ x	for all _____ x
Global minimum	**Local minimum**
$f(c)\ [\geq \mid \leq]\ f(x)$	$f(c)\ [\geq \mid \leq]\ f(x)$
for **all** x	for all ***nearby*** x



◆ Note: By the convention used **here**, endpoints can be global extrema, but NOT local.

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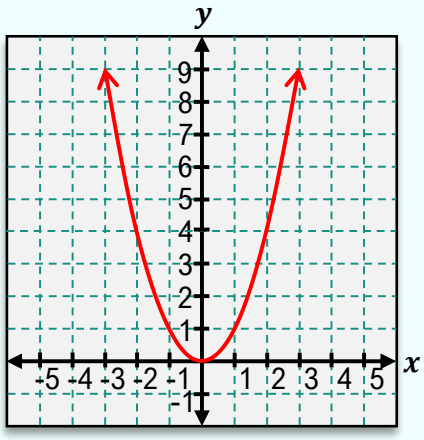
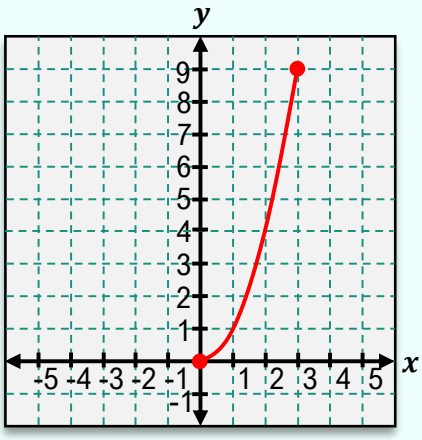
EXAMPLE Locate the extreme values of the function $f(x)$ on the specified domain.



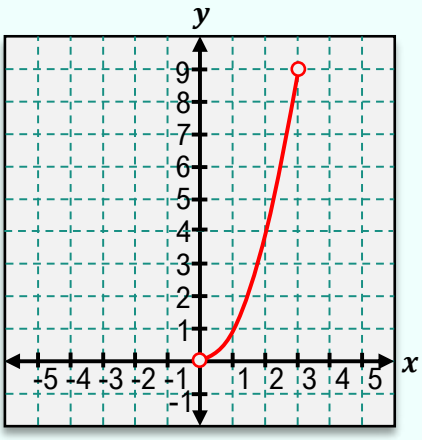
(A)

Domain: $(-\infty, \infty)$



(B)

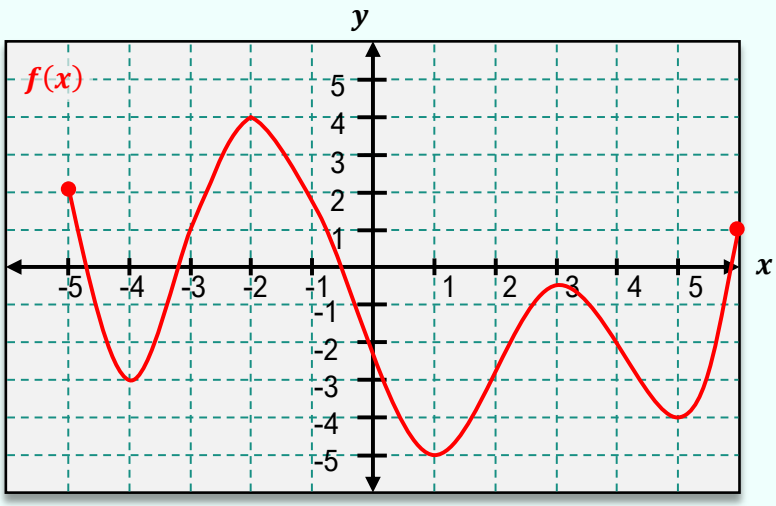
Domain: $[0,3]$



(C)

Domain: $(0,3)$

EXAMPLE Label where the local & global maxima and minima occur on the given graph of $f(x)$.



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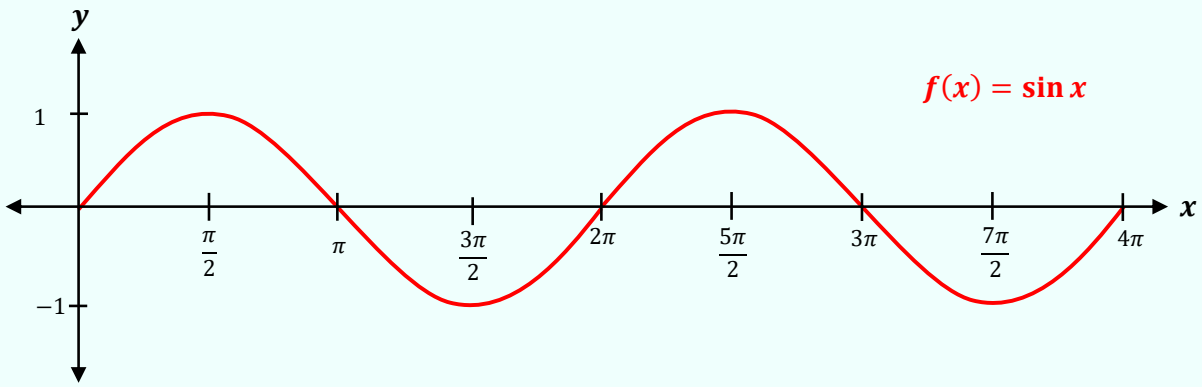
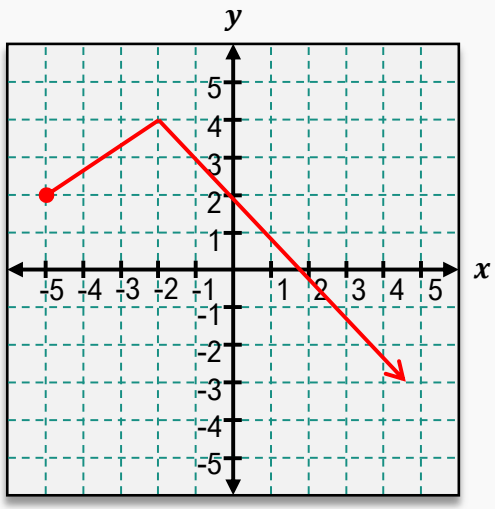
EXAMPLE Determine where the local & global maxima and minima occur on the given graph of $f(x)$.

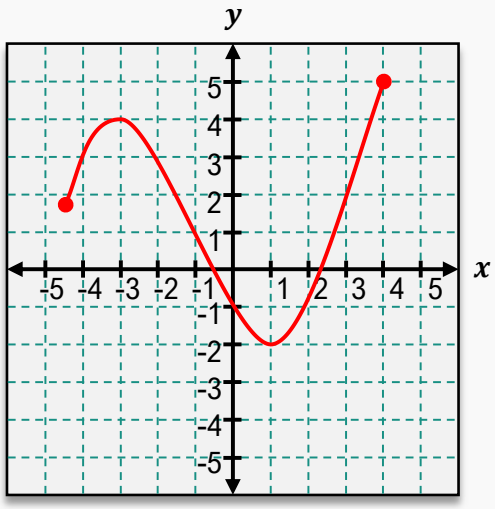


PRACTICE Determine where the local and absolute maxima and minima occur on the given graph of $f(x)$.

(A)



(B)



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EXAMPLE Sketch a graph of $f(x)$ that is continuous over the interval $[-3,2]$ and has the properties given below.

- ☐ Absolute maximum at $x = 2$
- ☐ Absolute minimum at $x = 0$
- ☐ Local maximum at $x = -2$