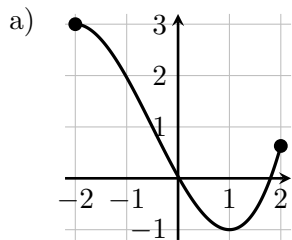


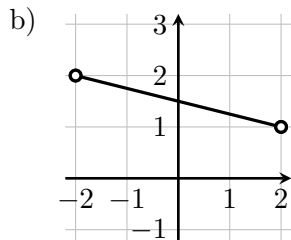
The Extreme Value Theorem

What does it take to be sure a function has an absolute minimum and an absolute maximum on a given domain?

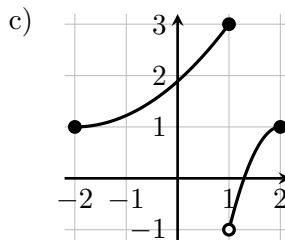
I. Samples – Study these sample functions and their descriptions and fill in the blanks.



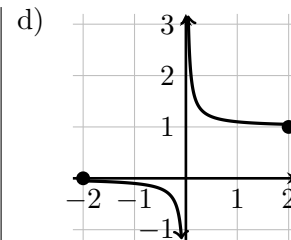
A continuous function with an absolute maximum of at $x = \underline{\quad}$ and an absolute minimum of at $x = \underline{\quad}$.
Domain:



A continuous function with no absolute maximum and no absolute minimum.
Domain:



A discontinuous function with an absolute maximum of at $x = \underline{\quad}$ and no absolute minimum.
Domain:



An unbounded discontinuous function with no absolute maximum and no absolute minimum.
Domain:

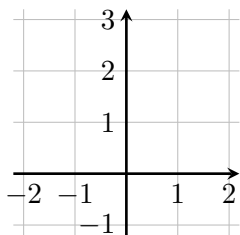
In sample c), there is no absolute minimum because:

_____.

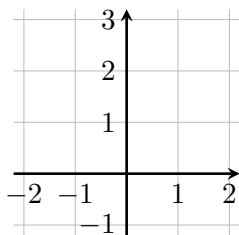
In sample d), there is no absolute maximum because:

_____.

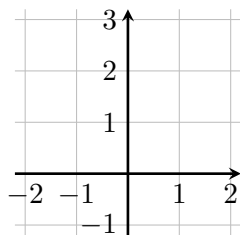
II. Examples – if possible, create graphs of functions satisfying each description



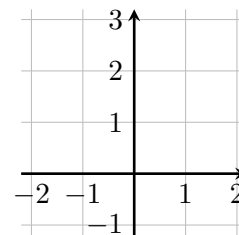
A continuous function with an absolute maximum of 3 and no absolute minimum.
Domain: $[-2, 2)$



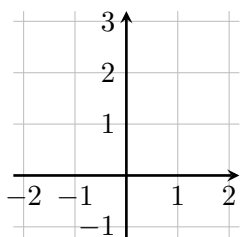
A continuous unbounded function with no absolute maximum and no absolute minimum.
Domain: $(-2, 2)$



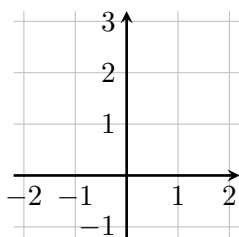
A continuous unbounded function with no absolute maximum and no absolute minimum.
Domain: $[-2, 2]$



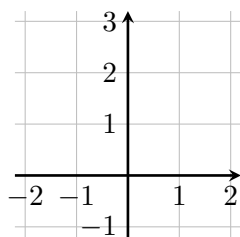
A bounded continuous function with an absolute maximum of 3 and no absolute minimum.
Domain: $(-\infty, \infty)$



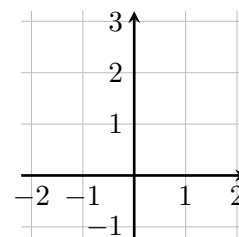
A continuous function with an absolute maximum of 3 and an absolute minimum of -1.
Domain: $(-2, 2)$



A function with an absolute maximum of 3 and no absolute minimum.
Domain: $[-2, 2]$



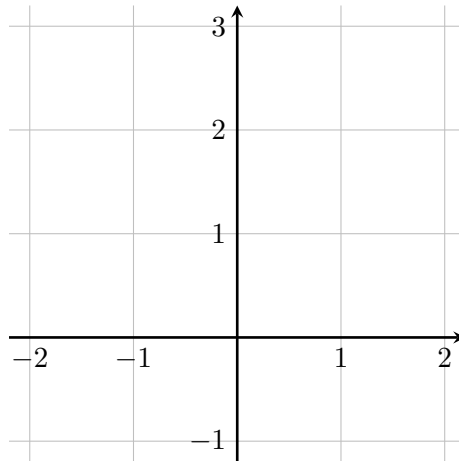
A function with no absolute maximum and no absolute minimum.
Domain: $[-2, 2]$



A continuous function with no absolute maximum and no absolute minimum.
Domain: $[-2, 2]$

III. Theorem: (Extreme Value Theorem) If f is _____ on a _____ interval $[a, b]$, then f must attain an absolute maximum value $f(c)$ and an absolute minimum value $f(d)$ at some numbers c and d in the interval $[a, b]$.

IV. Draw a continuous function with domain $[-2, 2]$.



Does it have an absolute maximum and absolute minimum?

Check the functions drawn by your classmates. Do all their examples also have absolute maxima and absolute minima? Explain!

Why does sample b) on the top of the previous page not contradict the Extreme Value Theorem?

Why does sample c) on the top of the previous page not contradict the Extreme Value Theorem?

Does the function $f(x) = 5 + 54x - 2x^3$ have an absolute maximum and an absolute minimum on the interval $[0, 4]$? Why or why not? If so, how would you go about finding the absolute maximum and absolute minimum?