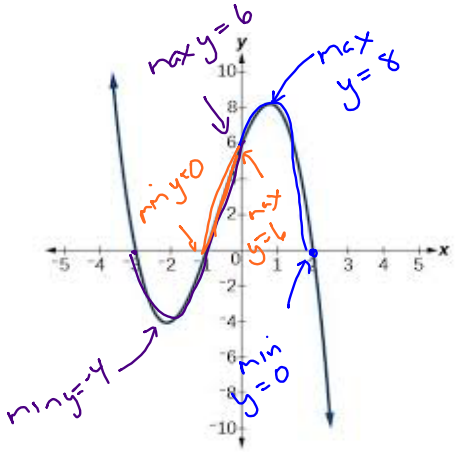
Date: _____

3.2 Maximum and Minimum on an Interval (Extreme Values)

For the graph shown below, identify the maximum and minimum values on the intervals:

a) [-3, 0] b) [0, 2] c) [-1, 0]



Are the values that you identified found at turning points or endpoints of the interval?

Yes → local max/min values can be either t.p.s or endpoints

Are there any other places that you could find a max or min on an interval?

No

Finding Extreme Values on an Interval

As long as a function is differentiable on the interval [a, b], you can identify the extreme values by:

- calculating f(x) at the endpoints of the interval (x = a, x = b).
- calculating f(x) at the turning points of the graph (f'(x) = 0).

The maximum on the interval is the largest value, and the minimum on the interval is the smallest.

For the graph in the example above, does the function have an absolute maximum? an absolute minimum? Why or why not?

No - odd degree function with opposite end behaviour

Example: The amount of light intensity on a point is given by the function $I(t) = \frac{t^2 + 2t + 16}{t + 2}$, where t is the time in seconds and $0 \le t \le 14$. Determine the time of minimal intensity.

① Check f(x) at endpoints

$I(0) = \frac{16}{2}$

$= 8$

$I(14) = \frac{(14)^2 + 2(14) + 16}{16}$

$= 15$

② Find turning pts.

$I'(t) = \frac{(2t+2)(t+2) - (t^2+2t+16)}{(t+2)^2}$

$= \frac{2t^2 + 6t + 4 - t^2 - 2t - 16}{(t+2)^2}$

$0 = \frac{t^2 + 4t - 12}{(t+2)^2}$

$(t+6)(t-2) = 0$

$t = -6$ or $t = 2$

not in our interval

③ Check I(2)

$I(2) = \frac{24}{4}$

$= 6$ ← minimal intensity at 2 seconds.