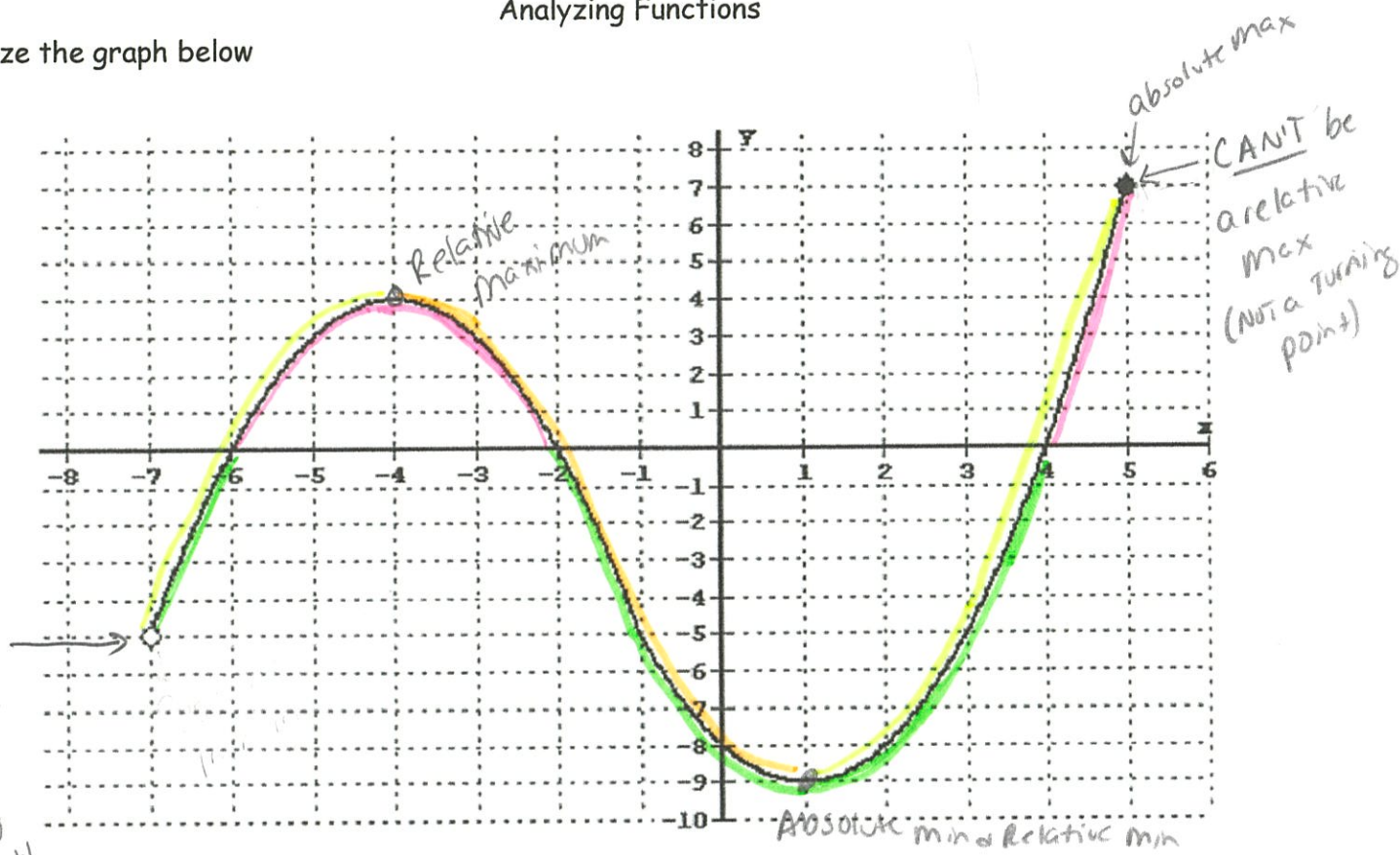


Analyzing Functions

Analyze the graph below



CAN'T be a relative min. (NOT a turning point)

CAN'T be a relative Max (NOT a turning point)

$f(-3) = 3$
 ↑ ↑
 x y

$f(1) = -9$
 ↑ ↑
 x y



$f(2) = -8$
 ↑ ↑
 x y

Domain: x-values
 • $\{x | -7 < x \leq 5\}$ or $(-7, 5]$
 ↑ ↑
 open closed
 circle circle

Range: y-values
 • $\{y | -9 \leq y \leq 7\}$ or $[-9, 7]$
 ↑ ↑
 set builder interval notation

Zeros: Solutions/x-intercepts/Roots (where y=0)
 where the function crosses the x-axis
 • $\{-6, -2, 4\}$ OR $x = -6, x = -2, x = 4$

Y-intercept: where the function crosses the y-axis (where x=0)
 • $y = -8$ or $\{-8\}$

<p style="text-align: right;">→ up the roller coaster</p> <p>Increasing: $y_1 < y_2$ Describe in terms of x</p> <ul style="list-style-type: none"> Between $x = -7$ & $x = -4$ OR Between $x = 1$ & $x = 5$ OR $(-7, -4) \cup (1, 5)$ OR $\{x \mid -7 < x < -4 \text{ OR } 1 < x < 5\}$ <p>() B/c NOT actually Increasing at those values</p>	<p style="text-align: right;">→ Down the roller coaster</p> <p>Decreasing: $y_1 > y_2$ Describe in terms of x</p> <ul style="list-style-type: none"> Between $x = -4$ & $x = 1$ OR $(-4, 1)$ OR $\{x \mid -4 < x < 1\}$ <p>() B/c NOT actually Dec. at those values</p>
<p>$f(x) > 0$ (positive): $y > 0$, function is above the x-axis (above x-axis) Describe in terms of x (Quad I + IV only)</p> <ul style="list-style-type: none"> Between $x = -6$ & $x = -2$ OR Between $x = 4$ & $x = 5$ inclusive OR $(-6, -2) \cup (4, 5]$ B/c $y > 0$ B/c: $y = 0$ (NOT actually pos) $\neq 0$ includes the 5 $\{x \mid -6 < x < -2 \text{ OR } 4 < x \leq 5\}$ 	<p>$f(x) < 0$ (negative): $y < 0$, function is below the x-axis (below x-axis) Describe in terms of x (Quad II + III only)</p> <ul style="list-style-type: none"> Between $x = -7$ & $x = -6$ OR Between $x = -2$ & $x = 4$ OR $(-7, -6) \cup (-2, 4)$ B/c up'n circle () B/c $y = 0$ (NOT actually neg) $\{x \mid -7 < x < -6 \text{ OR } -2 < x < 4\}$
<p>* Absolute maximum: largest y-value</p> <p>Describe with y-value or give the coordinate</p> <p>$y = 7$ OR $(5, 7)$</p>	<p>* Absolute minimum: smallest y-value</p> <p>Describe with y-value or give the coordinate</p> <p>$y = -9$ OR $(1, -9)$</p>
<p>** Relative maximum: Maximum Turning point</p> <p>Describe with y-value or give the coordinate</p> <p>$(-4, 4)$ OR $y = 4$</p> <p style="text-align: right;">T.P. </p>	<p>** Relative minimum: Minimum Turning point</p> <p>Describe with y-value or give the coordinate</p> <p>$(1, -9)$ OR $y = -9$</p> <p style="text-align: right;">T.P. </p>

can be the same

* Absolute Maximum/Minimum- can, but does NOT have to be a turning point

* Can only have 1 of each (max/min)

** Relative Maximum/Minimum- MUST be a turning point.

* Can have multiple relative max/mins

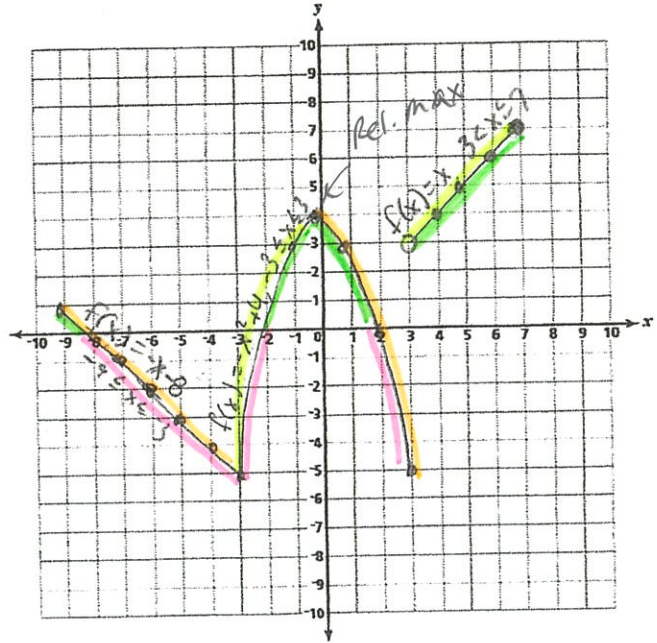


Taking a Closer Look!

Directions: Round answers to the nearest hundredth if needed.

Graph:

$$f(x) = \begin{cases} -x-8, & -9 \leq x \leq -3 \\ -x^2 + 4, & -3 \leq x \leq 3 \\ x, & 3 < x \leq 7 \end{cases}$$



1. Is it a function?

yes

2. Domain:

X-value $[-9, 7]$ or $\{x \mid -9 \leq x \leq 7\}$

3. Range:

Y-value $[-5, 7]$ or $\{y \mid -5 \leq y \leq 7\}$

4. x-intercept(s):

Where $y=0$ $\{-8, -2, 2\}$ or $x = -8, x = -2, x = 2$

5. y-intercept(s):

Where $x=0$ $y = 4, \{4\}$

6. Where is the graph **increasing**? y_1, y_2 (uphill)

in terms of x $\bullet (-3, 0) \cup (3, 7)$
 $\bullet \{x \mid -3 < x < 0 \text{ or } 3 < x < 7\}$

7. Where is the graph **decreasing**? y_1, y_2 (downhill)

$\bullet (-9, -3) \cup (0, 3)$
 $\bullet \{x \mid -9 < x < -3 \text{ or } 0 < x < 3\}$

8. Where is $y < 0$? below x-axis

$\bullet (-8, -2) \cup (2, 3)$

9. Where is $y > 0$? above x-axis

$\bullet (-9, -8) \cup (-2, 2) \cup (3, 7)$

10. Where is $y = 0$?

$\bullet \{-8, -2, 2\}$

11. Find y when $x = 3$

$y = -5$

12. For what x-value(s) is $y = 3$?

$x = -1 \text{ or } x = 1$

13. Maximum value of graph:

must be a Turning point Rel $(0, 4)$ or $y = 4$

14. Minimum value of graph:

must be a Turning point Rel $(-3, -5)$ or $y = -5$

Can only be 1 \rightarrow Abs $y = -5$ or $(-3, -5) + (3, -5)$

Can only be 1 \rightarrow doesn't have to be T.P.

Describe w/ y-values or give the pairs

Negative y-values

positive y-values

same as x-intercepts, roots, solutions