

Linear functions (taken from <http://www.asms.net/brewer/precal/PrecalculusNotes.pdf>)

A linear function is one of the form $f(x) = mx + b$, where m is the slope of the line and b is the y-intercept. $y = mx + b$ is called the slope-intercept form of the equation of a line.

The slope of a linear function can be found by taking the ratio of change in y-values over the change in x-values.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \text{"rise" over "run"}$$

Given the slope m and a point (x_1, y_1) on a line, the slope-intercept form can be easily found by plugging these values into the point-slope equation: $y - y_1 = m(x - x_1)$.

Lines with a 0-slope are called horizontal lines and are of the form $y = k$ for some constant k . Vertical lines are said to have "no slope" and are of the form $x = k$.

Two lines in a plane are parallel if they never intersect. Two lines are perpendicular if their intersection forms a 90° angle.

Let l_1 be the graph of $f_1(x) = m_1x + b_1$ and let l_2 be the graph of $f_2(x) = m_2x + b_2$. l_1 and l_2 are parallel if $m_1 = m_2$.

This is denoted $l_1 \parallel l_2$. l_1 and l_2 are perpendicular if $m_1 = -\frac{1}{m_2}$. This is denoted $l_1 \perp l_2$.

<u>slope-intercept form</u>	<u>Slope</u>	<u>horizontal lines</u>	<u>Parallel</u>
$y = mx + b$	$m = \frac{y_2 - y_1}{x_2 - x_1}$	$y = k$ for some constant k (0 slope)	$m_1 = m_2$
<u>point-slope equation</u>		<u>vertical lines</u>	<u>Perpendicular</u>
$y - y_1 = m(x - x_1)$		$x = k$ (no slope)	$m_1 = -\frac{1}{m_2}$

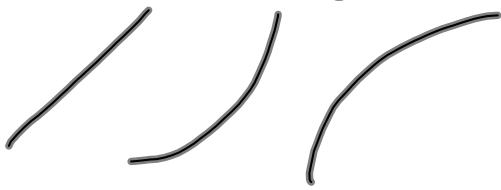
1.5 More on Functions

Topics to cover in this section:

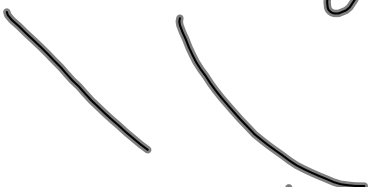
- identifying intervals on which a function is increasing, decreasing, constant
- identifying relative maxima and minima
- graphing piecewise functions
- greatest integer function

i.e. LOTS OF GRAPHING TODAY!

increasing



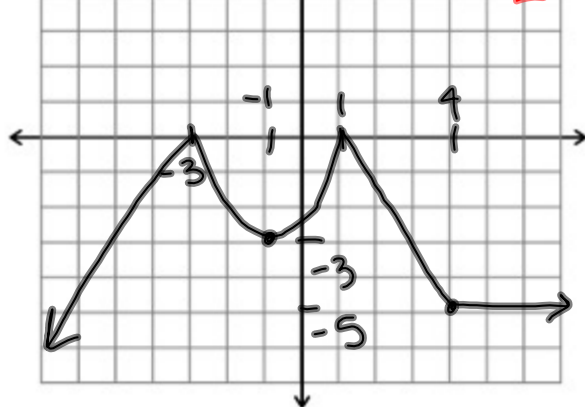
decreasing



constant

horizontal

domain: $(-\infty, \infty)$
range: $(-\infty, 0]$



constant: $(4, \infty)$
increasing: $(-\infty, -3) \cup (-1, 1)$
decreasing: $(-3, -1) \cup (1, 4)$

increasing:

$(-\infty, -3) \cup (-3, 0)$

decreasing:

$(0, 3) \cup (3, \infty)$

constant:

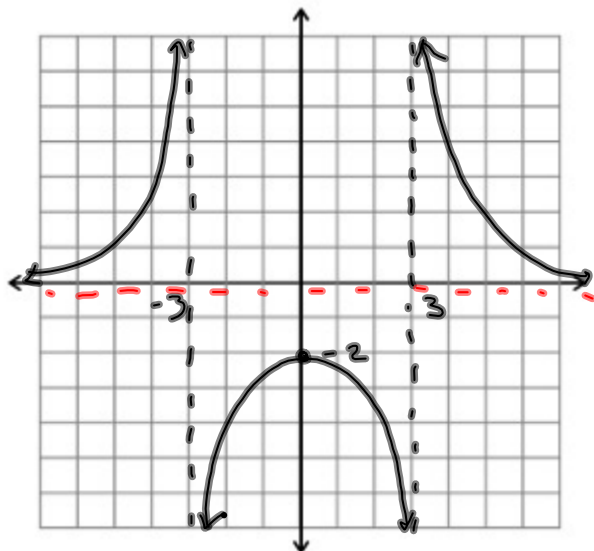
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domain:

$\{x | x \neq -3, 3\} = (-\infty, -3) \cup (-3, 3) \cup (3, \infty)$

range:

$(-\infty, -2] \cup (0, \infty)$



increasing:

$$(-\infty, -4) \cup (-2, -1) \cup (-1, 1)$$

decreasing:

$$(1, \infty)$$

constant:

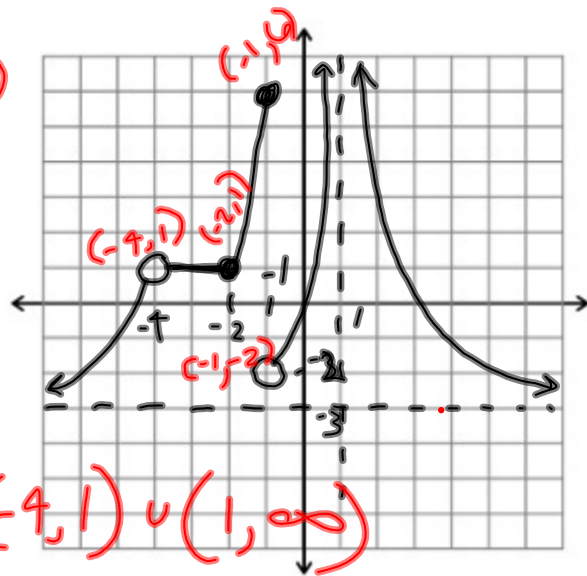
$$(-4, -2)$$

domain:

$$\{x | x \neq -4, 1\} = (-\infty, -4) \cup (-4, 1) \cup (1, \infty)$$

range:

$$(-3, \infty)$$



increasing:

$$(-3, 0) \cup (4, \infty)$$

decreasing:

$$(0, 2)$$

constant:

$$(-\infty, -3) \cup (2, 4)$$

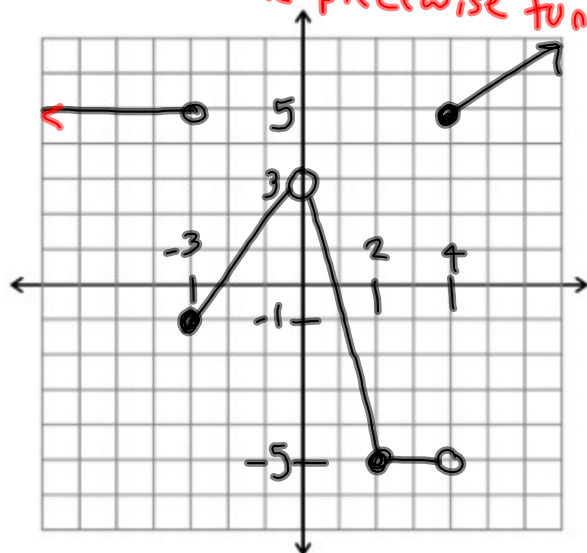
domain:

$$\{x | x \neq 0\} = (-\infty, 0) \cup (0, \infty)$$

range:

$$[-5, 3) \cup [5, \infty)$$

"Daniel" the piecewise function

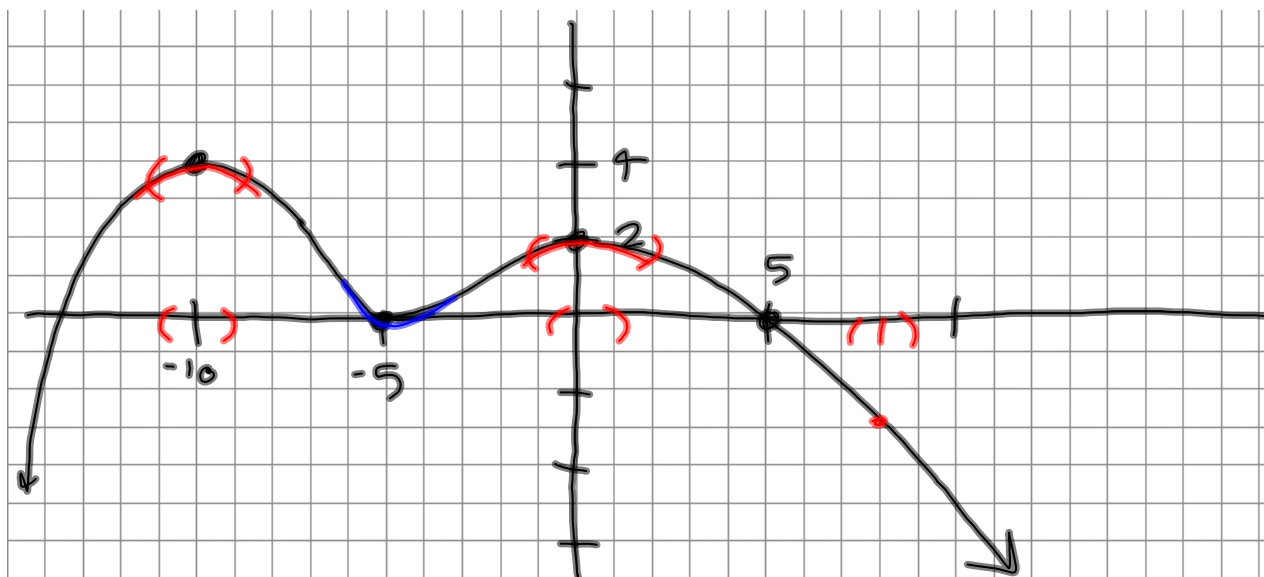


Maxima & Minima =

Extrema of a function

Absolute max/min refer to single highest or lowest values on the graph (if they exist)

Relative max/min refer to highest & lowest values in small intervals

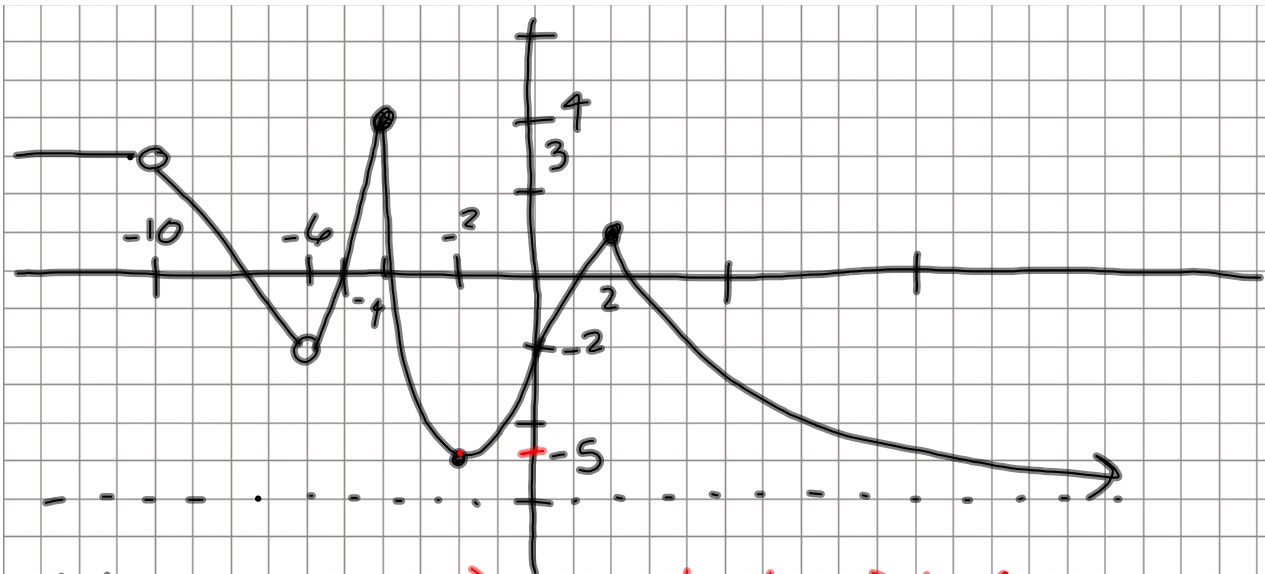


relative max: $(-10, 4)$ & $(0, 2)$

relative min: $(-5, 0)$

absolute max: 4 , occurs when $x = -10$ $(-10, 4)$

absolute min: none



relative min: $(-2, -5)$ *not @ $(-6, -2)$ bc function is undefined there

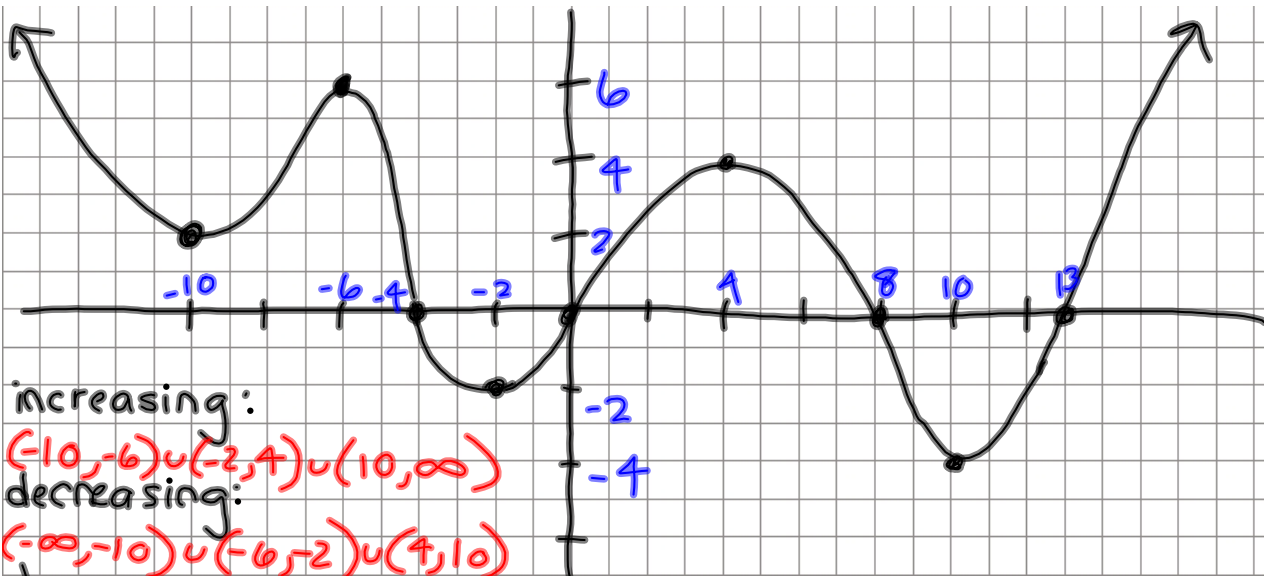
relative max: $(-4, 4)$ & $(2, 1)$

absolute min: none

absolute max: $(-4, 4)$

range:

$(-6, 4]$



increasing:

$(-10, -6) \cup (-2, 4) \cup (10, \infty)$

decreasing:

$(-\infty, -10) \cup (-6, -2) \cup (4, 10)$

domain:

$(-\infty, \infty)$

range: $[-4, \infty)$

relative max:

$(-6, 6), (4, 4)$

relative min:

$(-2, -2), (10, -4), (-10, 2)$

abs. max:

none

abs. min:

$(10, -4)$

Homework (to be turned in on Friday)

Assigned Monday: 1.2 #15-29odd; 40,41,42,45,48

Assigned Wednesday: 1.4 #35-41odd; 53-63odd

Assigned Thursday: 1.5#1-16all; ~~47-61odd,69-74all~~