For functions, you can rewrite the equation:

$$y = 2x - 4$$

$$f(x) = 2x - 4$$

"f at x"

the y value when x equals a certain value

$x = 2$ find y

$y = 2(2) - 4$

$y = 0$

find $f(2)$

$f(2) = 2(2) - 4$

$f(2) = 0$

$f(0) = 2$ $(0, 2)$

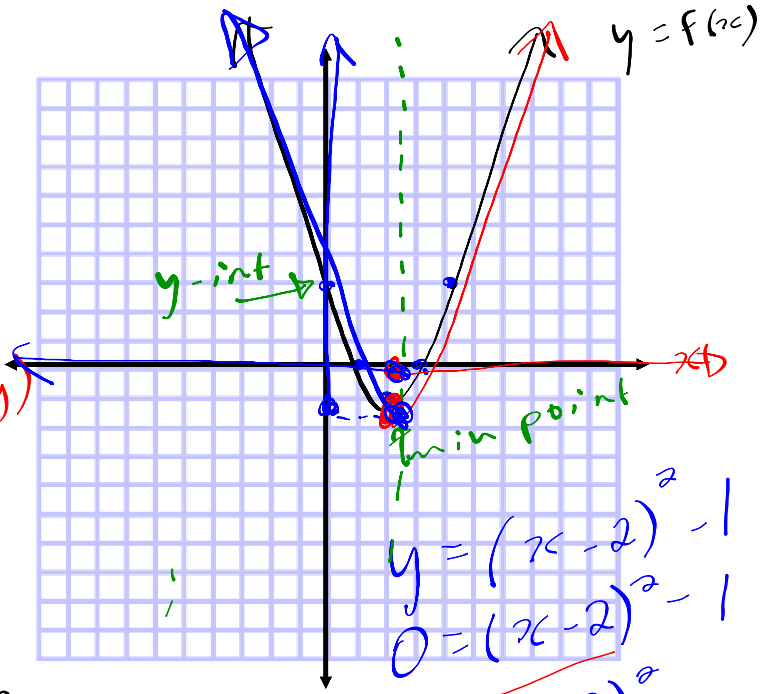
$f(1) = 3$ $(1, 3)$

$f(2) = 0$ $(2, 0)$

Unit 9: Characteristics of Functions

five new functions
and their characteristics

Recall:



- max/min point (vertex)
- y-int: the point (x,y) on the graph the intercepts the y-axis $f(0) \Rightarrow (0, y)$
- x-int(s): the point(s) on graph touches the x-axis $f(x)=0 \Rightarrow (x, 0)$
- axis of symmetry ex. $x=2$
  vertical line that divides the function evenly.
- domain: the set of x elements the function uses.
  → an interval ex $]-\infty, \infty[$
- range: the set of y elements the function uses.
  → an interval of y value $[-1, \infty[$

$y = (x-2)^2 - 1$

$0 = (x-2)^2 - 1$

$\sqrt{1} = \sqrt{(x-2)^2}$

$\pm 1 = x - 2$

$x = 3$

$x = 1$

- the increasing interval of a function: → x-values in interval notation
  → when reading the graph from left to right, it's where the graph goes up. The interval where as x increases, y increases. e.x. $[2, \infty[$

  the vertex is the turning point

- the decreasing interval of a function: → an interval of x-values)
  → left to right, it's where the graph is going down. As x values increase, the y values decrease e.x. $]-\infty, 2]$

Power Function : $y = x^3$

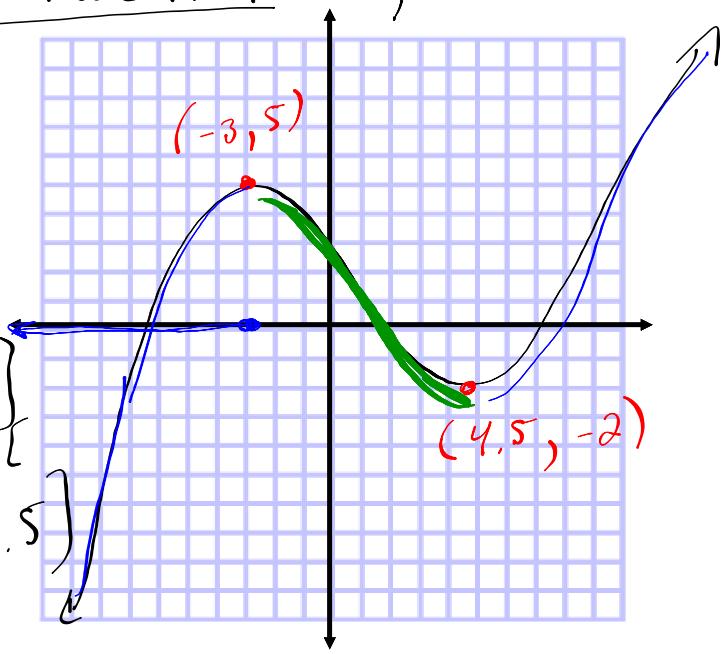
find $f(-3) = 5$

Domain : $]-\infty, \infty[$

Range : $]-\infty, \infty[$

Increasing Interval : $]-\infty, -3] \cup [4.5, \infty[$

Decreasing : $[-3, 4.5]$



Absolute Value Function: $y = |x|$

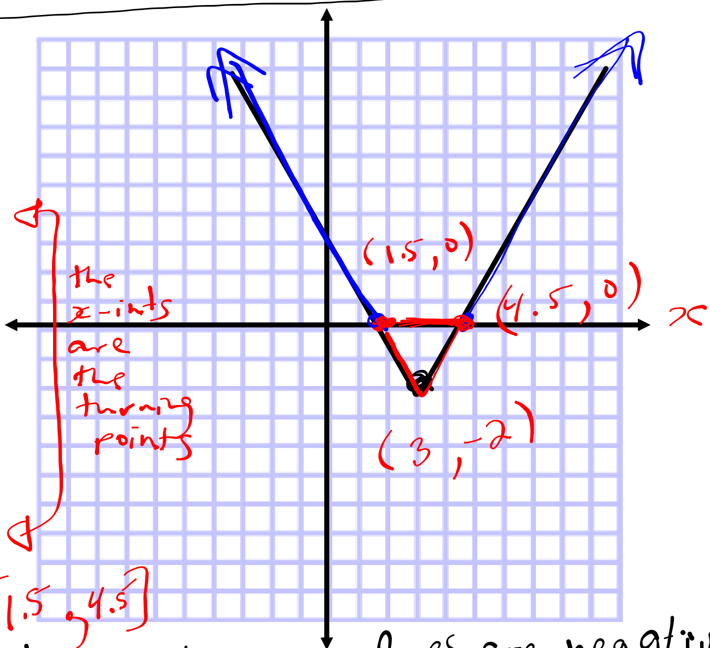
Characteristics Continued

Positive interval of a function (f) (give the x-values in the interval)

↳ the interval over which the y values are positive.

• the interval where the graph is above the x-axis

ex $]-\infty, 1.5) \cup (4.5, \infty[$



Negative interval of a function (f)

ex. $[1.5, 4.5]$

↳ the interval over which the y values are negative.

↳ the interval where the graph is below the x-axis.

ex.

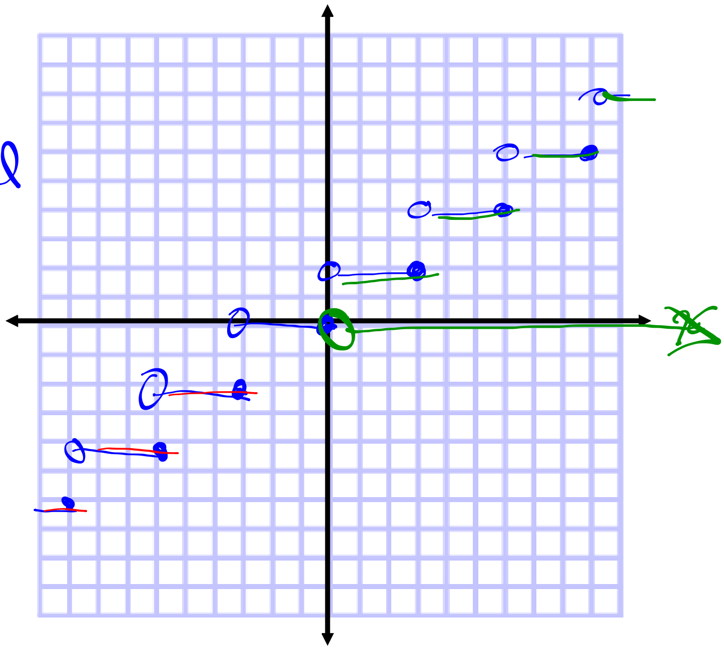
Greatest Integer Function : $y = [x]$
(Step Function)

Positive Interval
$]0, \infty$

Negative Interval
$]-\infty, -3]$

$f(0) = 0$

Increasing Interval
$]-\infty, \infty[$



Sinsoidal Function
(Wave Function)

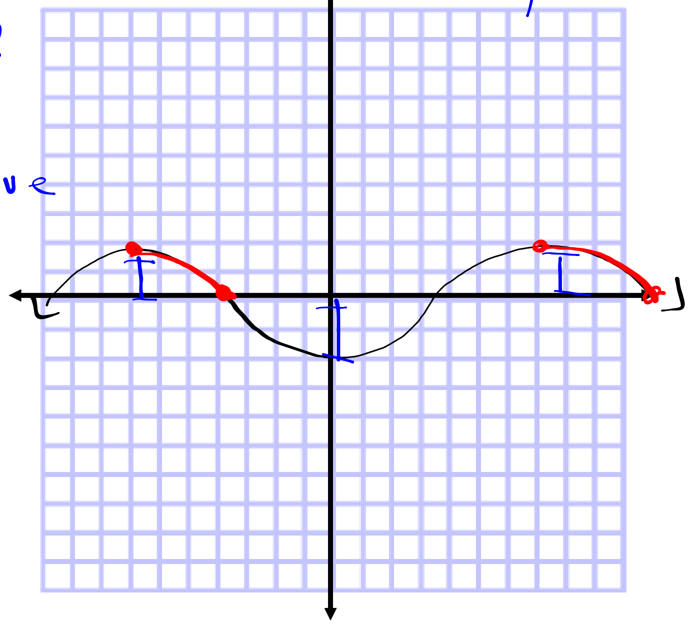
$y = \sin x$

Exam Calibre

Give one interval over which this function is positive and decreasing.

ex. $[-7, -4]$

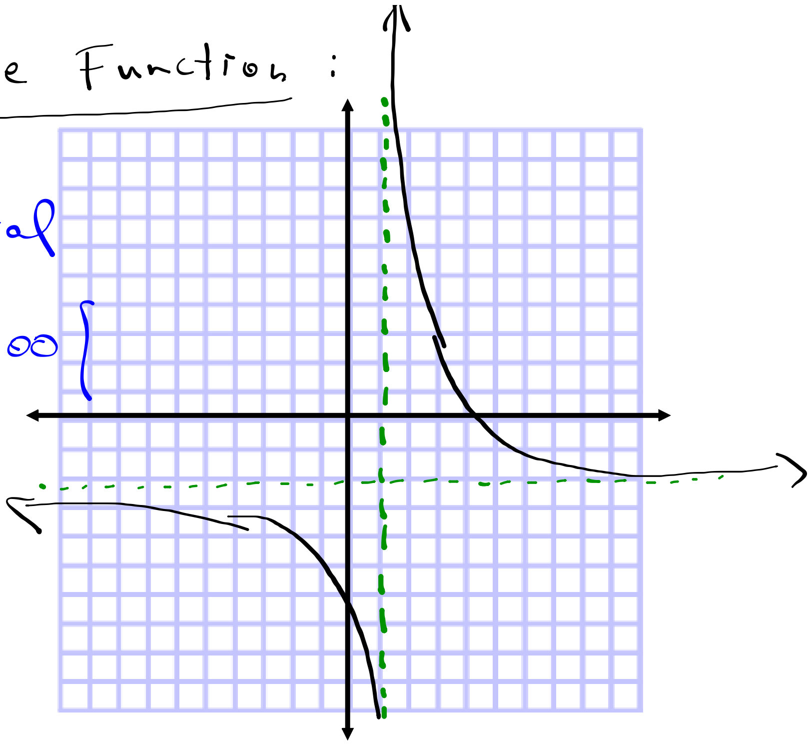
$[8, 10]$



Inverse Function :

Decreasing Interval

$]-\infty, 1[\cup]1, \infty[$



Unit 10: Quadratic Functions: graphing and finding the equation

General Form

$y = ax^2 + bx + c$

y-int $(0, c)$

$V\left(\frac{-b}{2a}, \frac{-\Delta}{4a}\right)$

x	y
V→	

Standard Form

$y = a(x-h)^2 + k$

$V(h, k)$

	x	y
	h−2	
	h−1	
V	h	k
	h+1	
	h−2	

X-intercept Form

$y = a(x - x_1)(x - x_2)$

x-ints: $(x_1, 0)$

$(x_2, 0)$

x	y
$x_1 - 1$	
x_1	0
$(x_1 + x_2) \div 2$	
x_2	0
$x_2 + 1$	

$V(4,3)$. ex. $y = 2(x-4)^2 + 3$

$V(h,k)$ $y = a(x-h)^2 + k$

ex. $y = 2(x+4)^2 + 3$

$V(-4,3)$

$y = a(x-h)^2 + k$

$y = a(x-(-4))^2 + 3$

$y = a(x+4)^2 + 3$

$y = a(x-h)^2 + k$

$y = -2(x-2)^2 - 2$

$V(2,-2)$

$y = -2(x+2)^2$

$V(-2,0)$

$y = a(x-h)^2 + k$

$y = -2x^2 - 2$

$V(0,-2)$

Converting Standard to General Form

e.g.

$y = 2(x-2)^2 + 4$

$y = 2(x-2)(x-2) + 4$

$y = 2(x^2 - 4x + 4) + 4$

$y = 2x^2 - 8x + 8 + 4$

$y = 2x^2 - 8x + 12$

graph
$y = 2(x-3)^2 - 2$
$y = a(x-h)^2 + k$
$v(3, -2)$

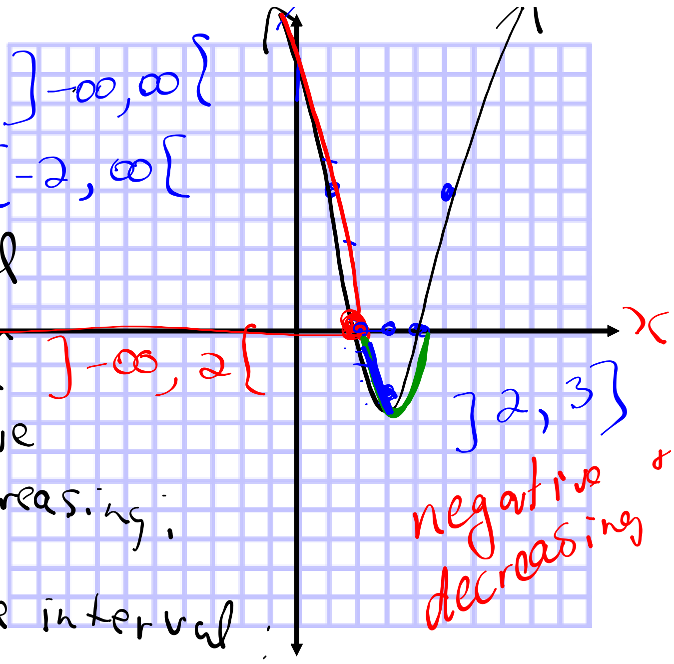
x	y
1	$2(1-3)^2 - 2 = 6$
2	$2(2-3)^2 - 2 = 0$
3	-2
4	$2(4-3)^2 - 2 = 0$
5	$2(5-3)^2 - 2 = 6$

Domain: $]-\infty, \infty[$

Range: $[-2, \infty[$

An interval over which the graph is positive and decreasing: $]-\infty, 2[$

Negative interval: $]2, 3]$ negative & decreasing



If need be find the x-ints w the quad formula.

Steps for determining the equation of a parabola

Step ①: Pick your starting equation, depending on what info you have.

ex. if Vertex is given → standard form

ex. if x-ints is given → x-int form

Step ②: Sub in the known values into the equation

Step ③: To solve for a, temporarily sub in the point (not vertex) and solve for a by isolating.

ex. pg 10.43

$V(\overset{h}{3}, \overset{k}{2})$

$P(\overset{x}{4}, \overset{y}{7})$

$y = a(x-h)^2 + k$

$y = a(x-3)^2 + 2$

$7 = a(4-3)^2 + 2$

$7 = a(1)^2 + 2$

$7 \overset{-2}{=} a \cdot 1 + 2 \; -2$

$a = 5$

$$\boxed{y = 5(x-3)^2 + 2}$$

Determine the quad function that has vertex $(\overset{h}{3}, \overset{k}{-1})$ and passes thru point $(\underset{x}{2}, \underset{y}{0})$

$$y = a(x-h)^2 + k$$
$$y = a(x-3)^2 - 1$$
$$0 = a(2-3)^2 - 1$$
$$0 = a(-1)^2 - 1$$
$$0 = a \cdot 1 - 1$$
$$0 + 1 = a - 1 + 1$$
$$a = 1$$
$$\boxed{y = 1(x-3)^2 - 1}$$

$$\boxed{y = -\frac{2}{3}(x+1)(x-3)}$$

Determine the quad function that has x-ints $(\overset{x_1,}{-1}, \overset{0}{0})$ $(\overset{x_2,}{3}, \overset{0}{0})$ and passes through point $(\overset{x}{0}, \overset{y}{2})$

$$y = a(x-x_1)(x-x_2)$$
$$y = a(x-(-1))(x-3)$$
$$y = a(x+1)(x-3)$$
$$2 = a(0+1)(0-3)$$
$$2 = a(1)(-3)$$
$$\frac{2}{-3} = \frac{\cancel{-3}a}{\cancel{-3}}$$
$$a = \frac{2}{-3}$$