Greatest Integer Function

f(x) = a [b(x-h)] + k

[x] – Represents the greatest integer of x

[x]=x where x ∈ Z … round the number inside the [ ] down to the nearest integer

a – Vertical stretch or contraction

step height – it is the distance between steps

If a is positive (+) steps go up ↗ if a is negative (-) steps go down ↘

b – Horizontal stretch or contraction

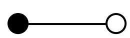
step length – how long the step is

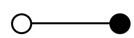
The step length is the reciprocal of the **"b"** term and it's always positive $\frac{1}{|b|}$

Example: f(x)=3[2(x-5)]-1

b=2, therefore the step length is $\frac{1}{|b|} = \frac{1}{|2|} = \frac{1}{2}$

If b is positive (+) steps go up ↗ if b is negative (-) steps go down ↘





h – Horizontal translation

k – Vertical translation

(h,k) – this is the coordinate of a "closed end point" (solid dot)

Greatest Integer Function

Properties

Domain – IR

Range – k + an, where n ∈ Z

Variation – The graph is either increasing or decreasing

increasing if ab>0 (positive) ↗

decreasing if ab<0 (negative) ↘

Sign – The graph is positive when it is above the x-axis
The graph is negative when it is below the x-axis

Zeros – The value of x, when f(x)=0

There is either 1 zero or none…the zero is an interval

$f(x) = 2\,[\,-3\,(x-5)\,] + 2$	
$0 = 2\,[\,-3\,(x-5)\,] + 2$	subtract 2 from each side
$-2 = 2\,[\,-3\,(x-5)\,]$	divide both sides by 2
$-1 = [\,-3\,(x-5)\,]$	**is the number on the left an integer? Yes! Then there is a zero and you can continue and solve for x. If No ☹, then there are no zeros.**
$-1 = -3\,(x-5)$	divide both sides by -3
$\frac{1}{3} = x-5$	add 5 to both sides
$\frac{16}{3} = x$	

y-intercept – The value of y, when x=0

$f(x) = 2\,[\,-\frac{1}{3}\,(x-5)\,] + 2$	
$f(x) = 2\,[\,-\frac{1}{3}\,(0-5)\,] + 2$	
$f(x) = 2\,[\,-\frac{1}{3}\,(-5)\,] + 2$	
$f(x) = 2\,[\,\frac{5}{3}\,] + 2$	any fractions that appear within [ ], are rounded down to the nearest integer.
$f(x) = 2\,(1) + 2$	
$f(x) = 4$	

Extrema – There is no maximum or minimum for the function

Greatest Integer Function

From Rule → Graph

- Need h and k – (h,k)
  This is your first solid end point

- Is b positive or negative?
  If b>0, then the step is ●——○
  If b<0, then the step is ○——●

- What is the step length?
  b=2, therefore the step length is $\frac{1}{|b|} = \frac{1}{|2|} = \frac{1}{2}$

- What is the distance between the steps (height)?
  a=?

- Is the graph increasing or decreasing?

  Increasing (ab>0) – the steps are going up ↗

  Decreasing (ab<0) – the steps are going down ↘

With all this information you are ready to graph!

Greatest Integer Function

From Graph → Rule

Need:

- (h,k) – This can be any solid endpoint found on the graph
- a – The distance (height) between the steps
- b – The length of the step…remember $\frac{1}{|b|}$
- You can determine the sign of b based on the direction of the step

If ●——○ Then b is positive

If ○——● Then b is negative

- You can determine the sign of a based on whether the graph is increasing or decreasing and depending on the sign of b that you found above

If the graph is increasing then ab>0
If b is positive, then a must be positive (+ • + = +)
If b is negative, than a must be negative (- • - = +)

If the graph is decreasing then ab<0
If b is positive, then a must be negative (+ • - = -)
If b is negative, then a must be positive (- • + = -)

This is all the information you need to write your rule!