Topic: Graphing transformations of log functions

Question: Will the graph of the function have a vertical asymptote or a horizontal asymptote?

$$y = \log_2(x - 7)$$

Answer choices:

A It will have a vertical asymptote at $x = 7$

B It will have a vertical asymptote at $x = -7$

C It will have a horizontal asymptote at $y = -7$

D It will have a horizontal asymptote at $y = 7$

Solution: A

Because $y = \log_2(x - 7)$ is a logarithmic function, its graph will have a vertical asymptote. To find it, we'll set its argument equal to zero,

$$x - 7 = 0$$

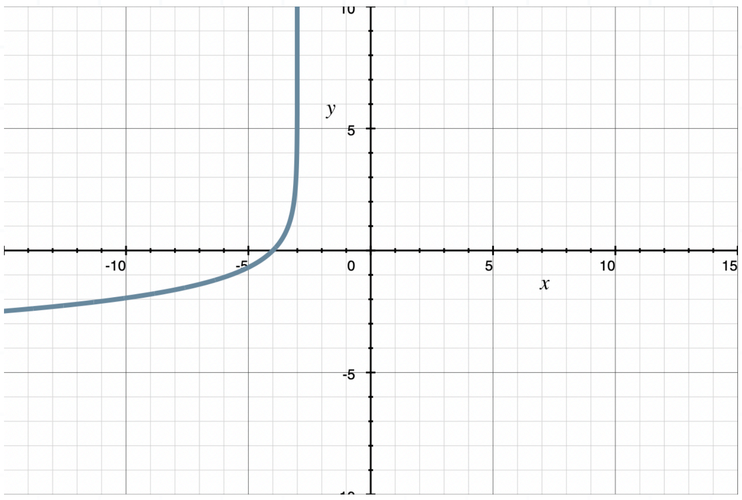
$$x = 7$$

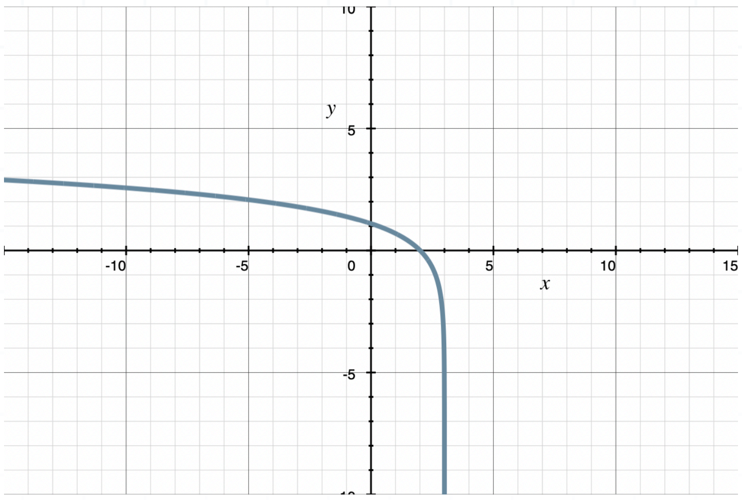
The vertical asymptote is $x = 7$.

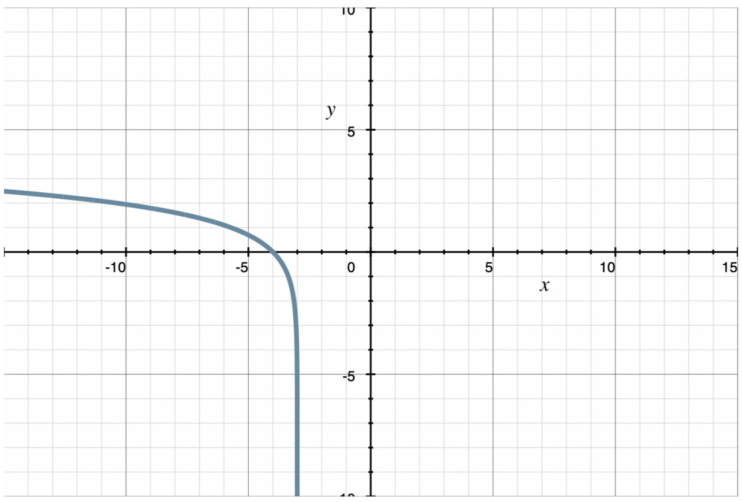
Topic: Graphing transformations of log functions

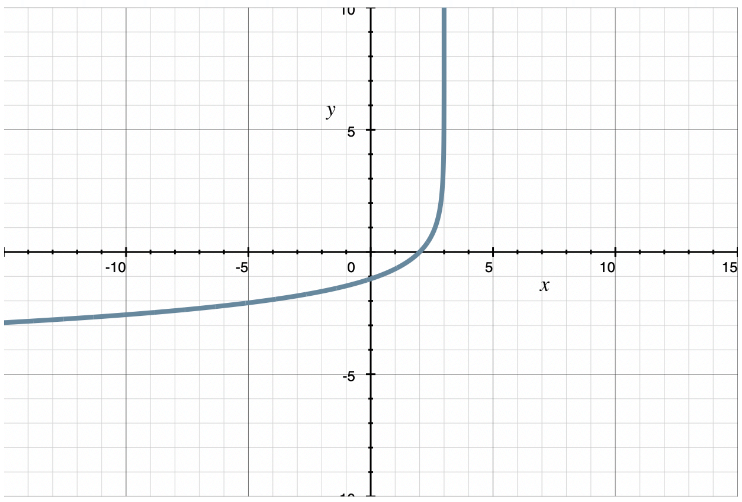
Question: Use transformations to sketch the graph of $y = -\ln(-x+3)$.

Answer choices:

A


B


C


D


Solution: D

We know to apply transformations in this specific order:

1. Horizontal stretch or compression

2. Horizontal shift

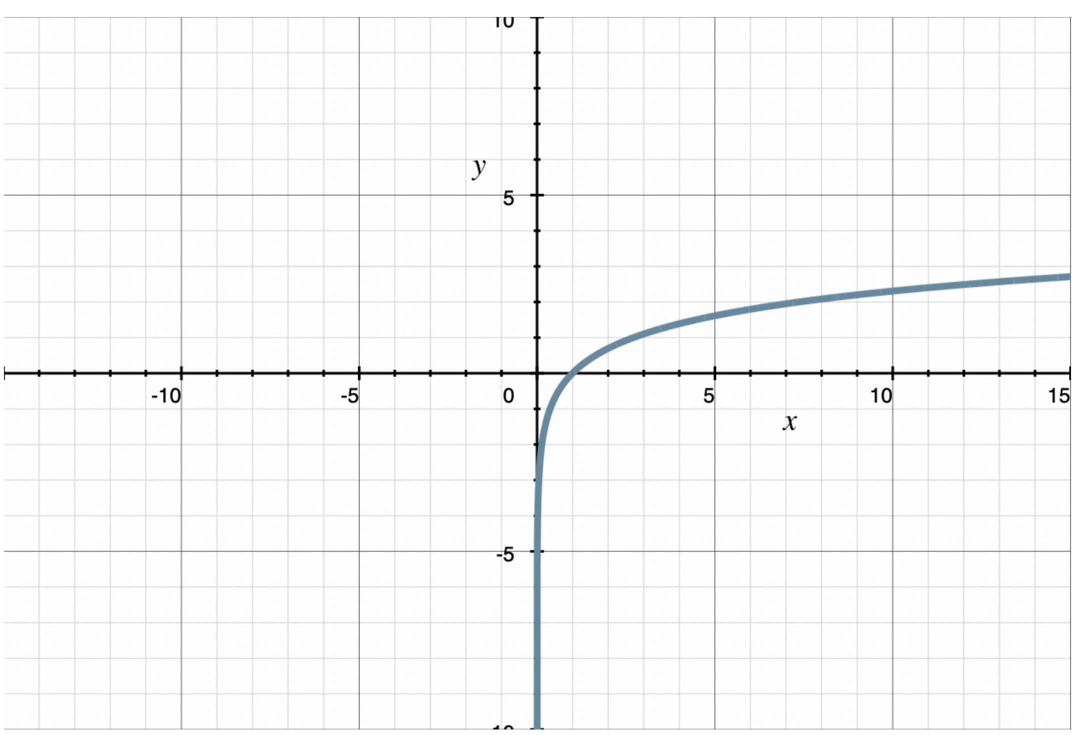
3. Horizontal reflection

4. Vertical stretch or compression

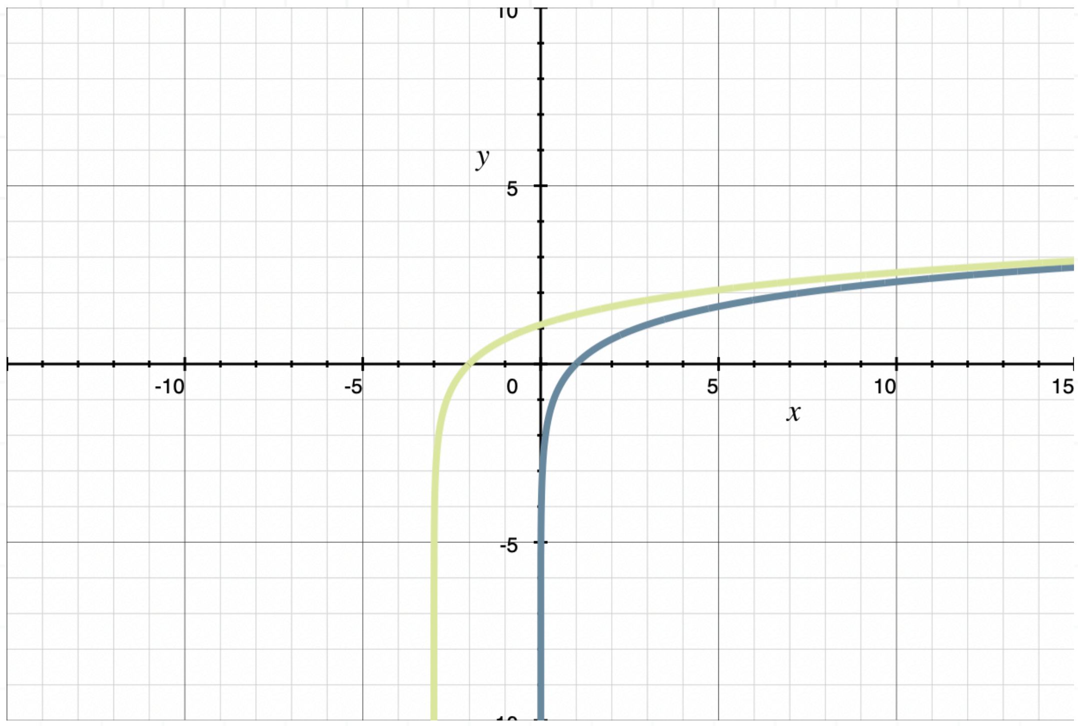
5. Vertical reflection

6. Vertical shift

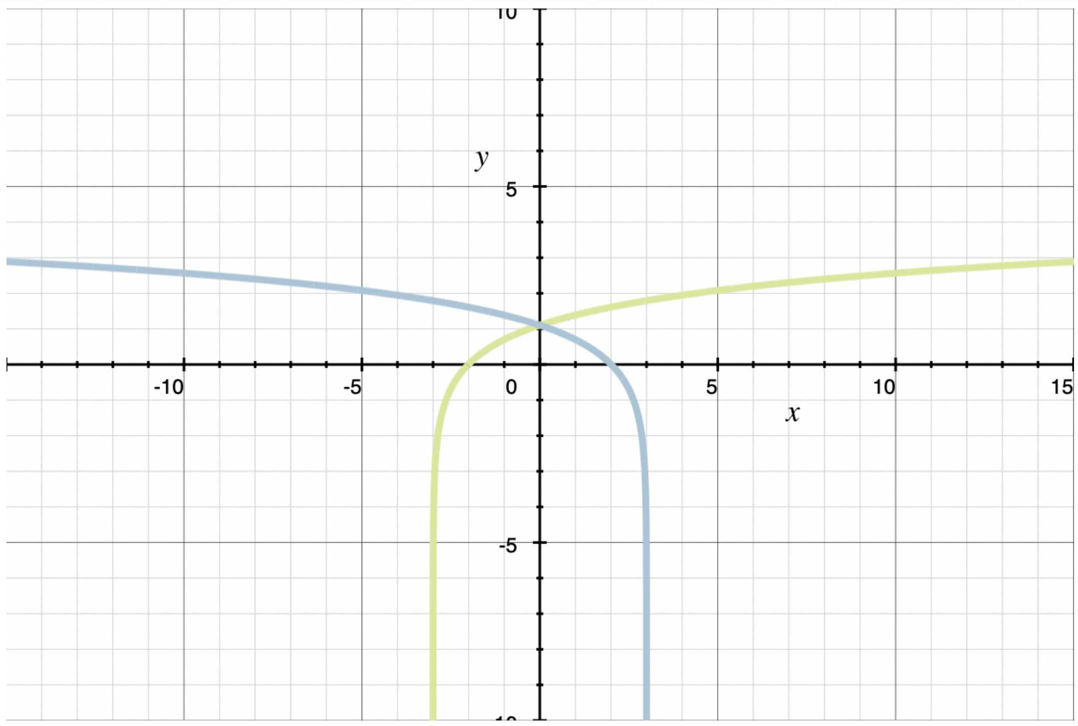
In the function $y = -\ln(-x + 3)$, there's no horizontal stretch or compression, but there's a horizontal shift 3 units to the left. So if we start by graphing the parent function $y = \ln x$,



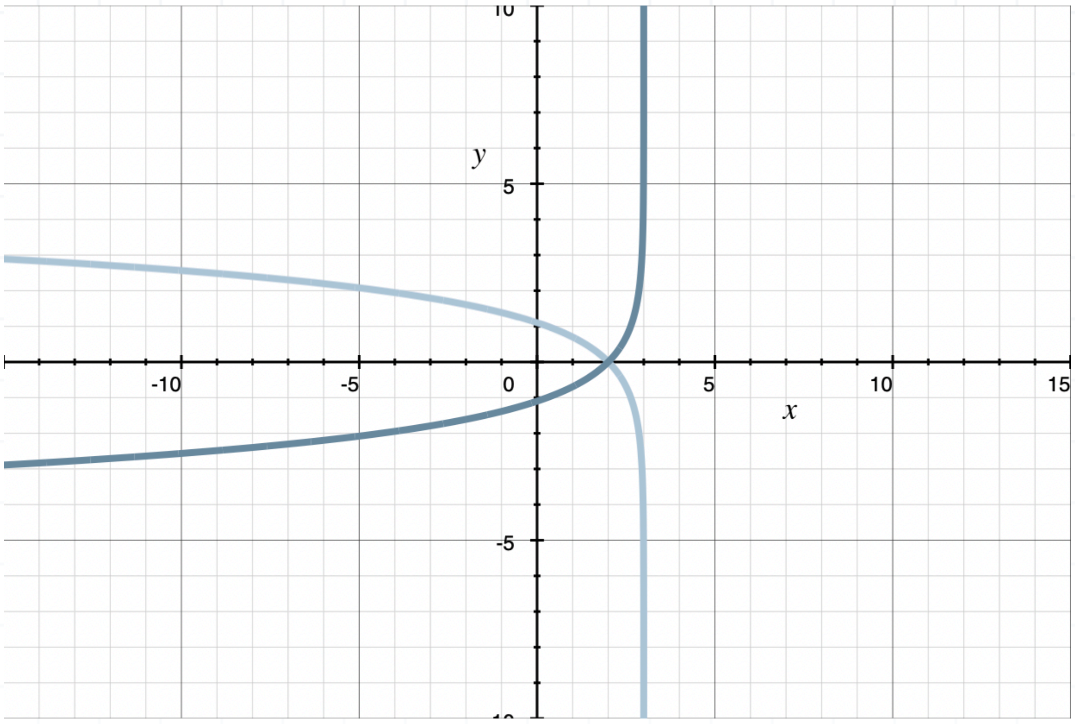
then we can shift it 3 units to the left to get $y = \ln(x + 3)$.



Then we'll reflect this curve over the vertical axis (a horizontal reflection) to get $y = \ln(-x + 3)$.

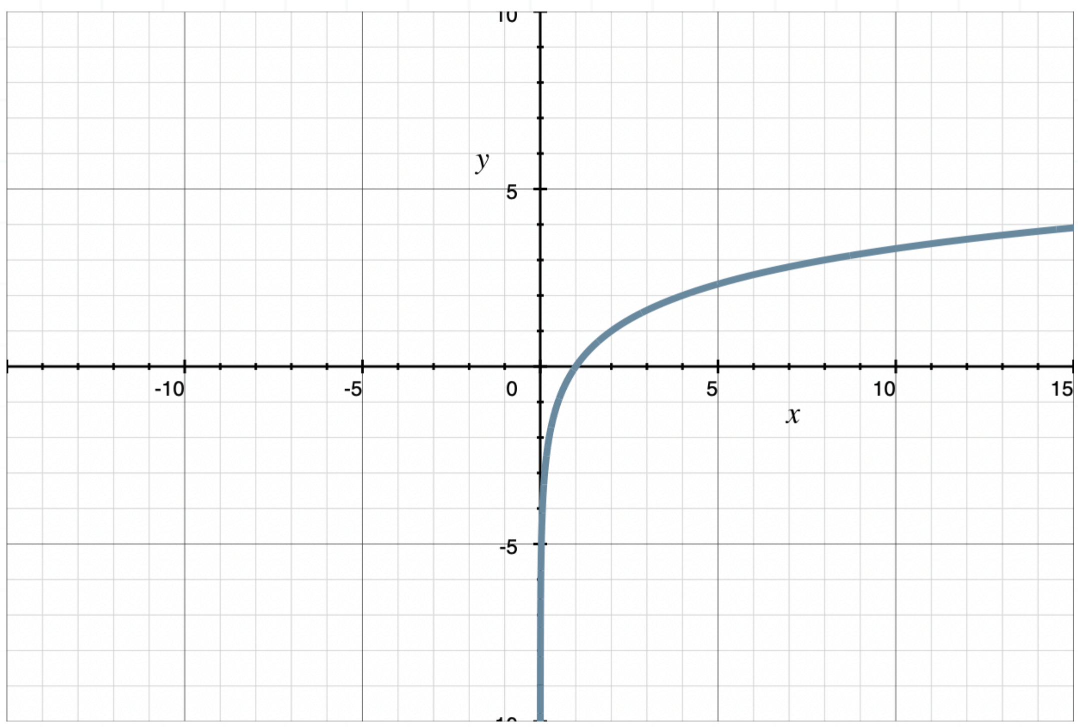


There's no vertical stretch or compression, but there is a vertical reflection, so we'll reflect the curve over the horizontal axis to get the final version of $y = -\ln(-x + 3)$.


y
x
-10
-5
0
5
10
15
-5

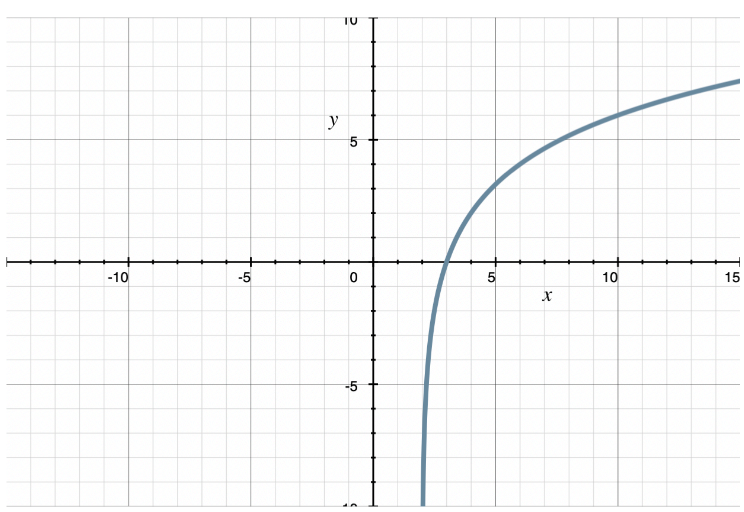
Topic: Graphing transformations of log functions

Question: Given the graph of $y = \log_2(x)$, use transformations to sketch the graph of $y = 2\log_2(x - 2)$.

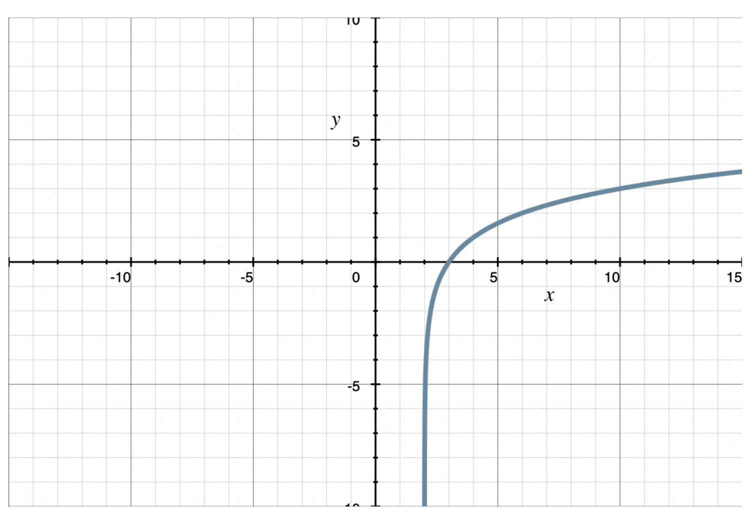


Answer choices:

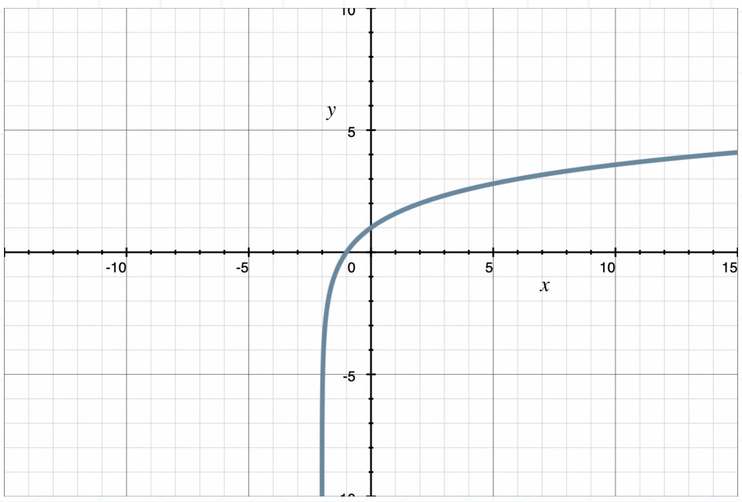
A



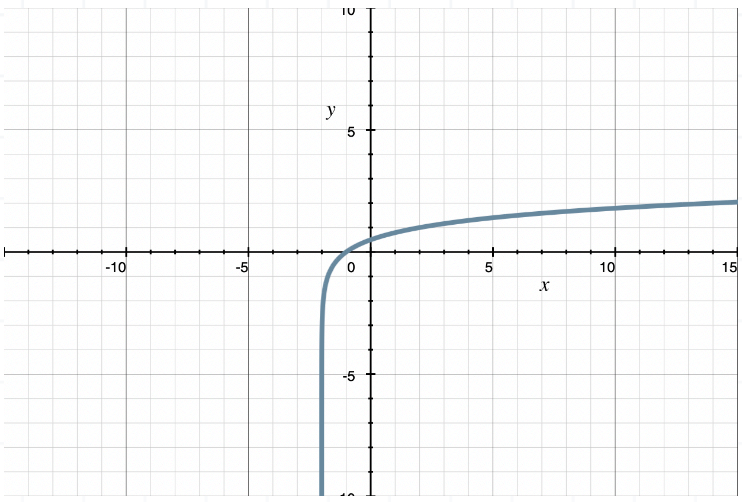
B



C



D



Solution: A

We know to apply transformations in this specific order:

1. Horizontal stretch or compression

2. Horizontal shift

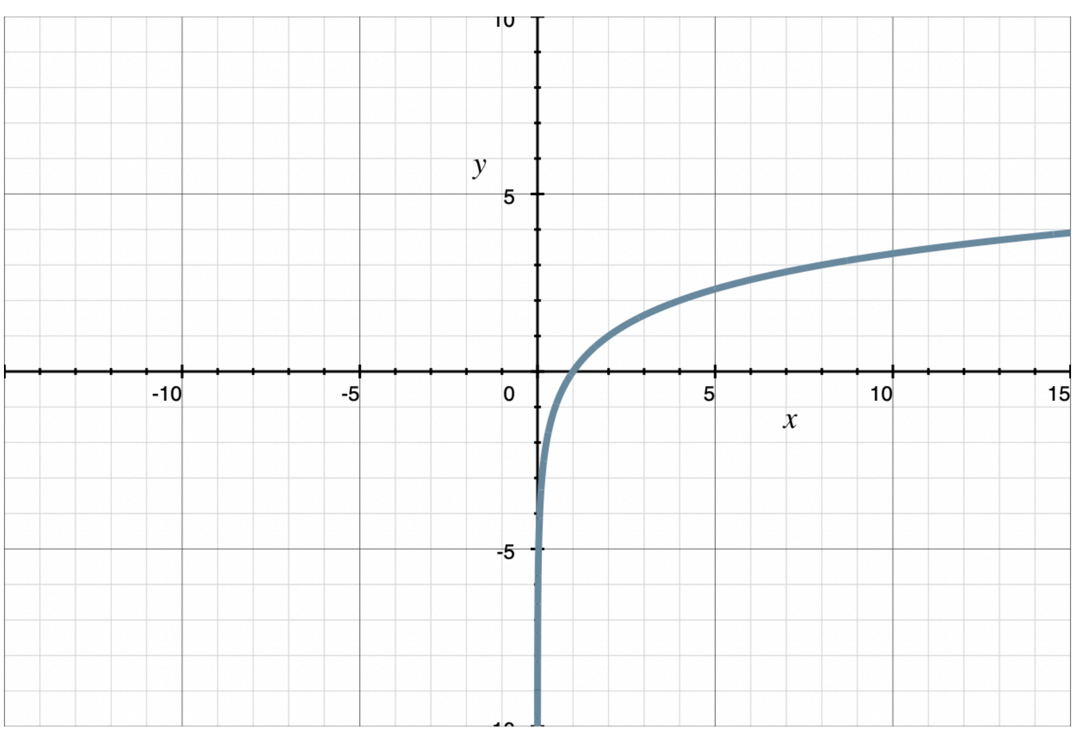
3. Horizontal reflection

4. Vertical stretch or compression

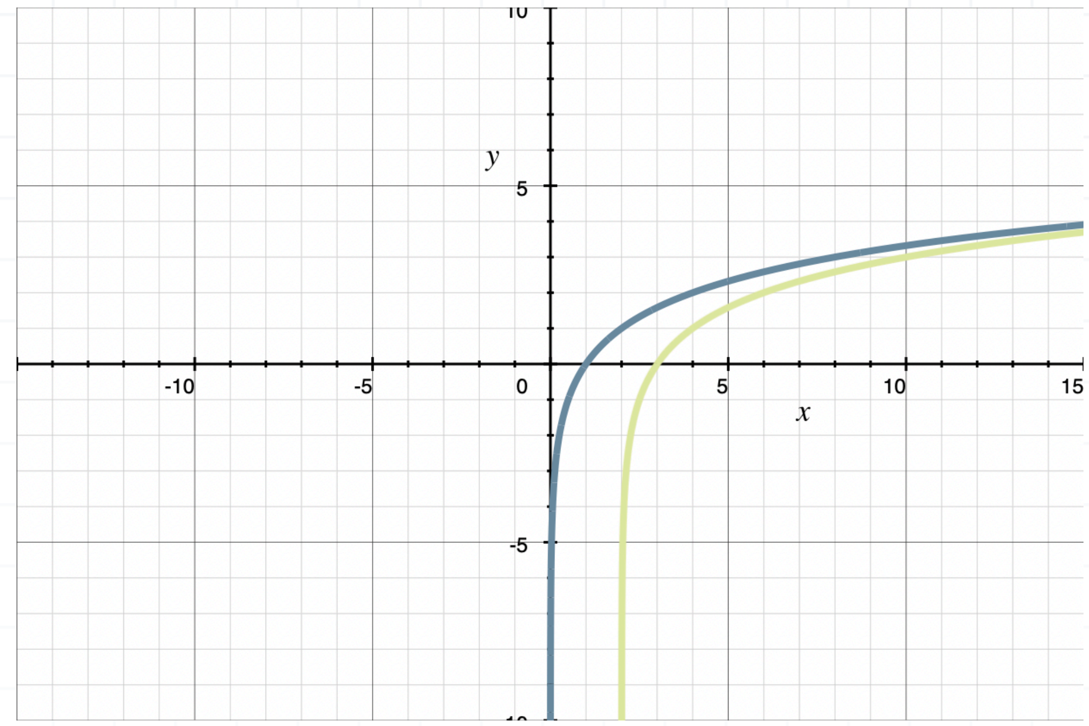
5. Vertical reflection

6. Vertical shift

In the function $y = 2\log_2(x - 2)$, there's no horizontal stretch or compression, but there's a horizontal shift 2 units to the right. So if we start by graphing the parent function $y = \log_2(x)$,



then we can shift it 2 units to the right to get $y = \log_2(x - 2)$.



Then we'll stretch this curve vertically by a factor of 2 to get the final version of $y = 2\log_2(x-2)$.