Warm Up -

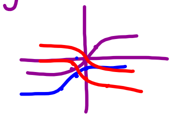
Get out your WB pg. 77 and a calculator.

$f(x) = 2x + 5$

$f^{-1}(f(-1))$

$(f^{-1} \circ f)(-1)$

$y = \sqrt[3]{x+1} - 2$ (0,0) (1,1) (-1,-1)



$-\sqrt[3]{x} - 2$

$\cancel{x^4 - 2x + 7}$

$3x^2 - 10x - 8 \neq 0$

-24, 2, -12

$3x^2 + 2x - 12x - 8$

$x(3x+2) - 4(3x+2)$

$(x-4)(3x+2) \neq 0$

$x \neq 4$ | $x \neq -\frac{2}{3}$

$-\frac{2}{3}$, 4

$(-\infty, -\frac{2}{3})(-\frac{2}{3}, 4)(4, \infty)$

18

$18x^2 - 2 \neq 0$

$2(9x^2 - 1) \neq 0$

$2(3x-1)(3x+1) \neq 0$

$3x - 1 \neq 0$ | $3x + 1 \neq 0$

$x \neq \frac{1}{3}$ | $x \neq -\frac{1}{3}$

$(-\infty, -\frac{1}{3})(-\frac{1}{3}, \frac{1}{3})(\frac{1}{3}, \infty)$

$18x^2 - 6x + 6x - 2$

$6x(3x-1) + 2(3x-1)$

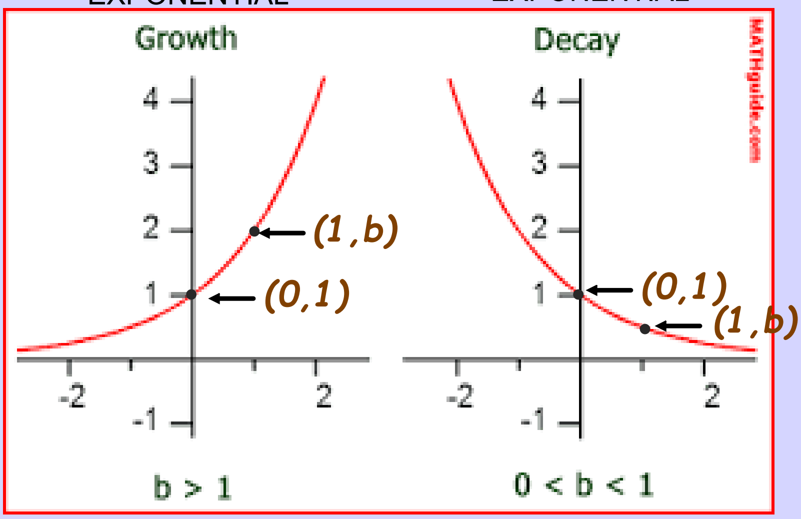
$(6x+2)(3x-1)$

$6x \neq 2$, $x = \frac{1}{3}$ | $3x - 1 \neq 0$, $x = \frac{1}{3}$

Feb 4-11:12 AM

NEW PARENT FUNCTION: $y = ab^x$

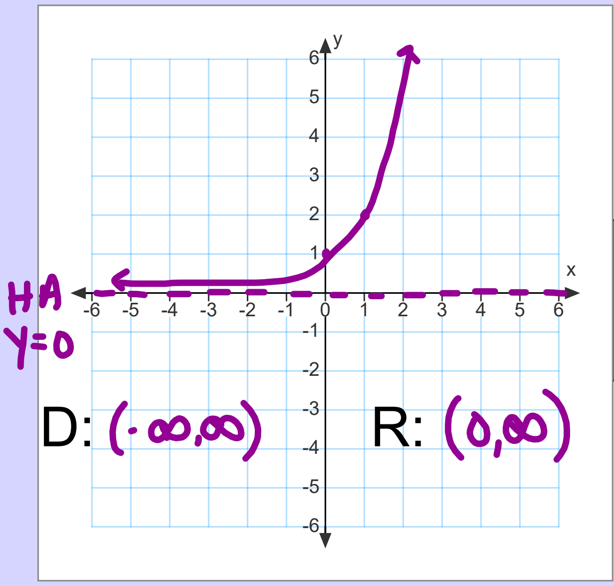
EXPONENTIAL Growth | EXPONENTIAL Decay



Aug 14-8:25 AM

$y = ab^x$

where x is a real number, $a \neq 0$, $b > 1$, $b \neq 0$.



Let's graph $y = 2^x$

a=1
b=2

The graph will never hit the x-axis ($y = 0$). This is called the horizontal **asymptote**.

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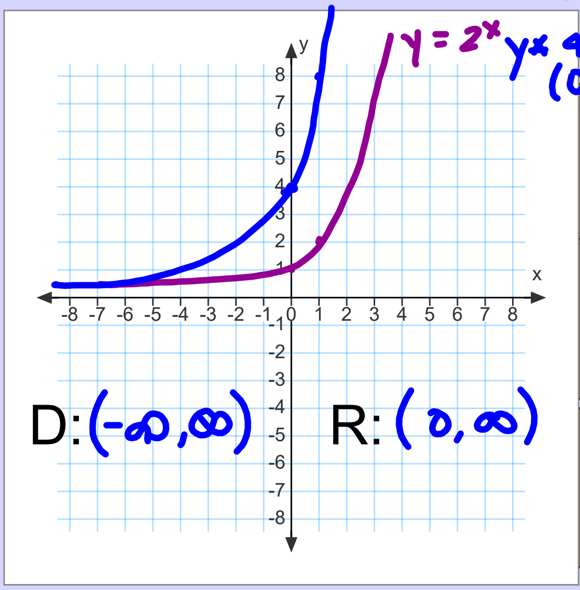
Now let's graph $y = 4(2)^x$ vertical stretch

a=4 b=2

(0,1)(1,2)



(0,4)(1,8)

Notice the y-intercept is now (0,4).

The graph will never hit the x-axis ($y = 0$). This is called the horizontal **asymptote**.

Given $y = ab^x$, the y-intercept will always be (0,a)

Aug 14-8:25 AM

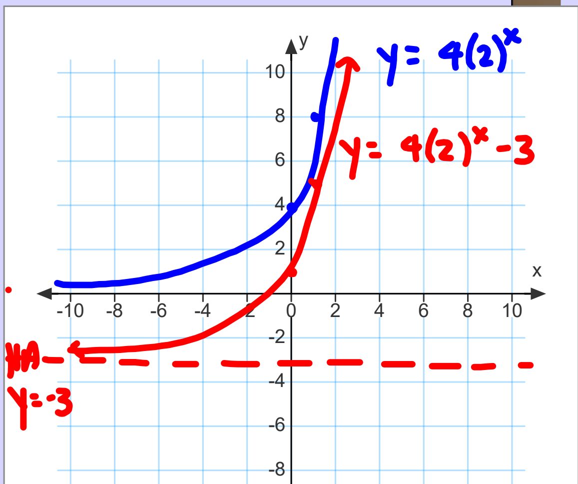
What will happen to the graph in this case?

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

HA

Pull

Notice the y-intercept is WAS (0,4), but is now SHIFTED DOWN 3 more.



D: $(-\infty,\infty)$ R: $(-3,\infty)$

The asymptote WAS y = 0, but is now SHIFTED DOWN 3 more so it's $y=-3$.

Pull

Always plot ~~3~~ 2 points!

(0,1)(1,6)(-1,1/6)

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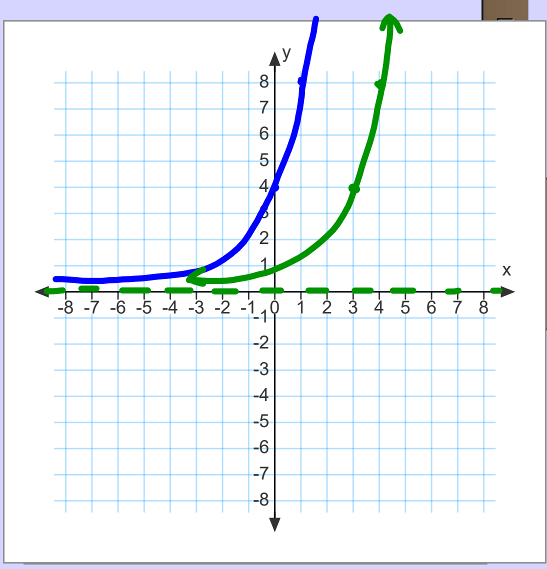
What will happen to the graph in this case?

$y = 4(2)^{x-3}$ right 3!

Notice the y-intercept is WAS (0,4), but is now SHIFTED RIGHT 3 more.



The asymptote WAS y = 0, but, will it change in this case?

Pull

D: $(-\infty,\infty)$ R: $(0,\infty)$

Aug 14-8:25 AM

Exponential Growth Model

You can use an exponential function to model growth or decay

$y = ab^x$ where $b = 1 \pm r$

$y = a(1 \pm r)^x$

So we will use:

$y = a\,(1 \pm r)^x$

ending amount → y

initial amount — initial amount

rate as a decimal — rate of growth/decay written as decimal

time — time

Aug 14-8:25 AM

$y = a(1 \pm r)^x$

Kirsten invests $2000 into a CD with a 5% annual interest rate. ↳ .05

a. Write an equation that represents the amount of money in the CD over time.

$y = 2000(1 + .05)^x$

$y = 2000(1.05)^x$

b. How much money will she have after 15 years?

$y = 2000(1.05)^{15}$

$= 4157.86$

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You can use an exponential function with 0<b<1 to model exponential __decay__: $y = ab^x$ *where* $b<1$

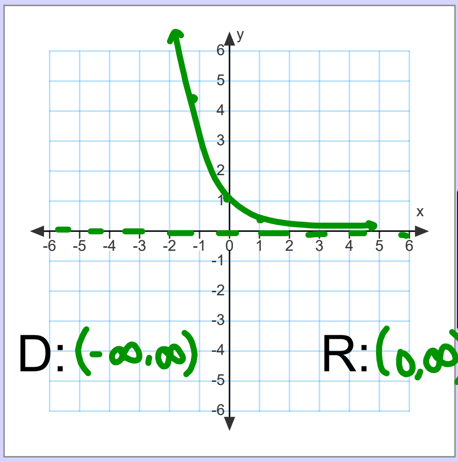
Let's graph $y = (0.25)^x$

$a = 1 \quad b = \frac{1}{4}$

$(0,1)(1,\frac{1}{4})(-1,4)$

The y-intercept is (0,a).

Notice the ***asymptote*** *is still y = 0.*



D: $(-\infty,\infty)$ R: $(0,\infty)$

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FIRST graph: $y = 6\left(\frac{1}{3}\right)^x$ Then graph: $y = 6\left(\frac{1}{3}\right)^{x-3} - 4$

$(0,1)(1,\frac{1}{3})$

$y \times 6 \ (0,6)(1,2)$

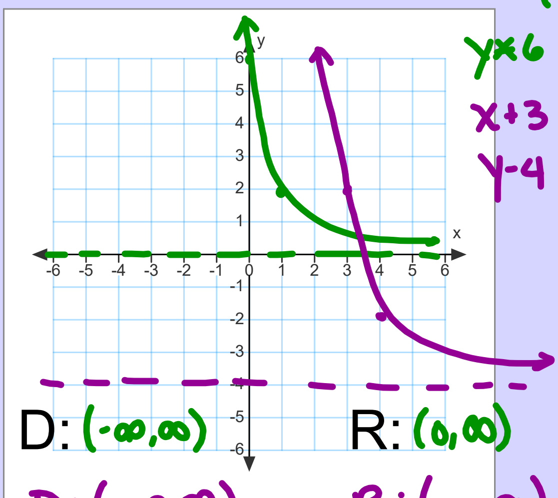
$x+3 \ (3,6)(4,2)$

$y-4 \ (3,2)(4,-2)$

The y-intercept i

Notice the ***asy***

is still y = 0.



D: $(-\infty,\infty)$ R: $(0,\infty)$

D: $(-\infty,\infty)$ R: $(-4,\infty)$

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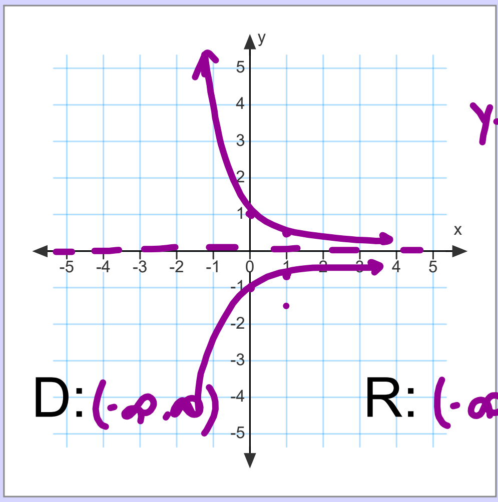
What would this graph look like? Let's plot some points! using reference pts

(0,1)(1,½)

y*-1 (0,-1)(1,-½)

$$y = -\left(\frac{1}{2}\right)^x$$



D: (-∞,∞)

R: (-∞,0)

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So for decay we will use:

$$y = a(1-r)^x$$

Quinn's new motorcycle is valued at $15,000. With an annual depreciation rate of 25%, find the value of the motorcycle after 5 years?

$y = 15000(1-.25)^5$

$y = 15000(.75)^5$

$y = 3559.57$

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Without graphing, determine whether each function represents exponential growth or exponential decay.

$y = 125(1.6)^x$ | $y = \frac{1}{4}\left(\frac{1}{2}\right)^x$ | $y = 2(0.3)^x$ | $f(x) = \left(\frac{5}{2}\right)^x$

growth | decay | decay | growth

Aug 14-10:49 AM

For each function, find the percent increase or decrease.

$$y = 125(1.6)^x$$

$1 + .6$

60% increase

$$y = 2(0.3)^x$$

$2(1 - .7)$

70% decrease

Feb 21-6:50 PM

GO COUGARS!

HW 8.1/8.2

p. 434 # 5, 7, 5b,13-16 all, 25-29 odd,
30, 32, 36-38 all, 60-62 all

Feb 21-6:50 PM