Determining Exponential Equations

Apr. 11/2012

$$y = af[k(x-p)] + q$$

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

h. reflect
→ change base

(b) $y = 2^{x+1}$
$= 2^x \cdot 2^1$
$= 2(2^x)$

h. shift
→ v. scaling

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

(c) $y = 2^{2x}$
$= (2^2)^x$
$= 4^x$

h. scaling
→ change base

$$y = a(b^x) + q$$

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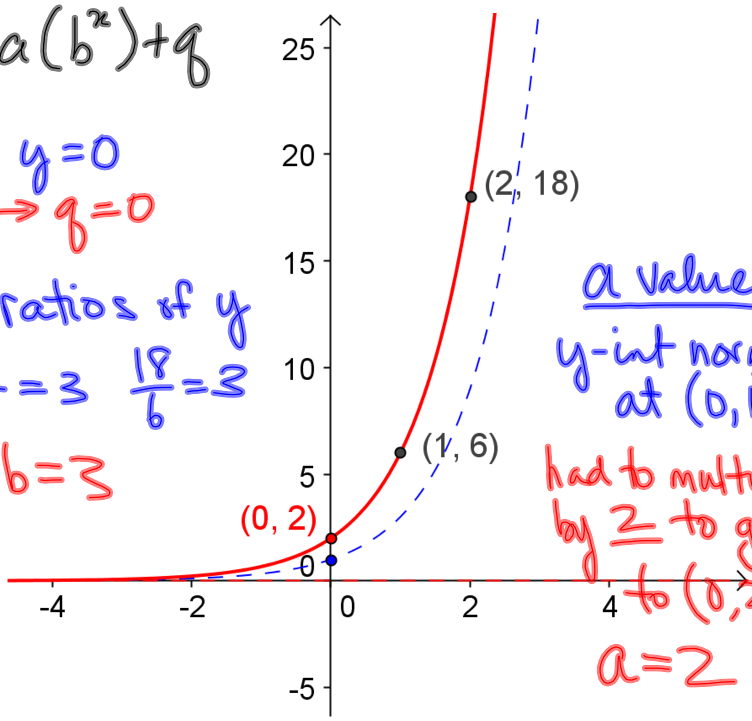
$$y = a(b^x) + q$$

HA: $y = 0$
→ $q = 0$

b: ratios of y
$\frac{6}{2} = 3$ $\frac{18}{6} = 3$
$b = 3$



a value
y-int normally at (0,1)
had to multiply by 2 to get to (0,2)
$a = 2$

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

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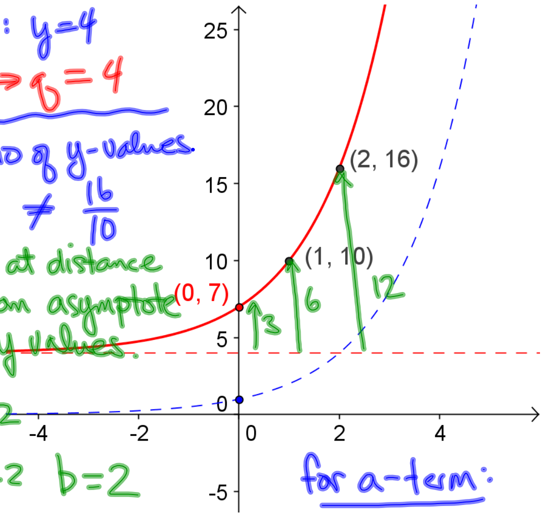
HA: $y=4$

$\rightarrow q=4$

ratio of y-values

$\frac{10}{7} \neq \frac{16}{10}$

look at distance from asymptote to y values.



$\frac{6}{3}=2$

$\frac{12}{6}=2 \quad b=2$

for a-term:

original y-int is 1 unit above asymptote.

new y-int is 3 units above y-int

$\Rightarrow a=3$

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

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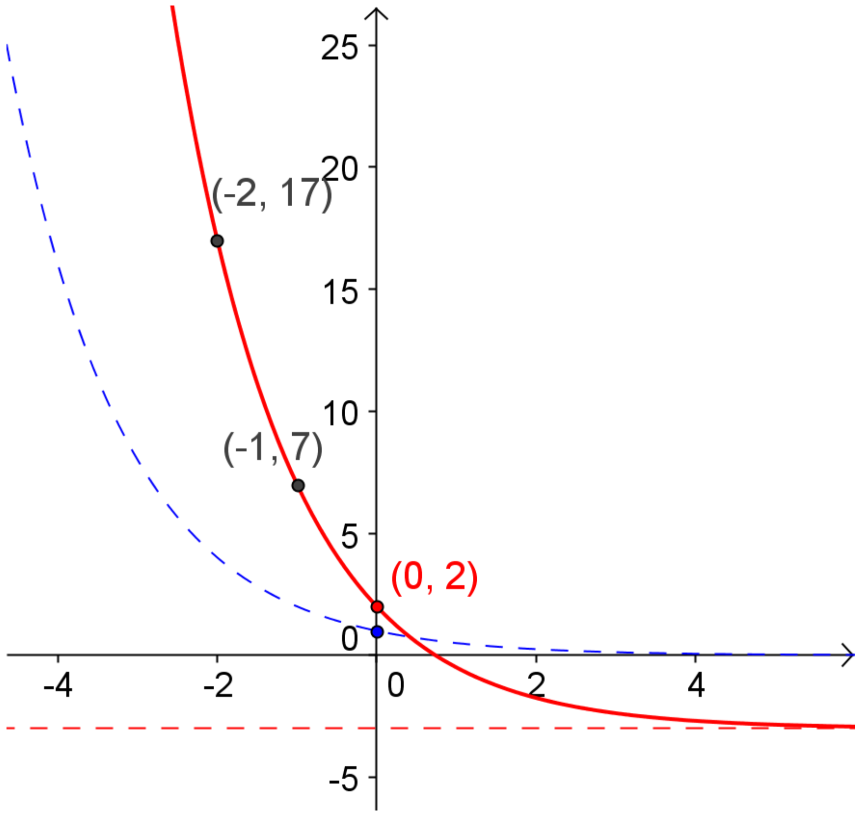

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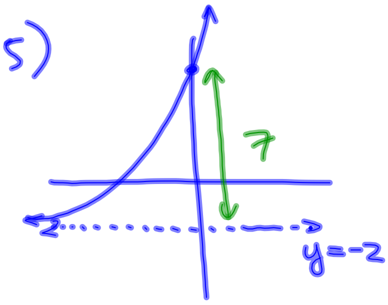
Ex.1

$b=3$ ✓ $(0,5)$

HA: $y=-2$

$q=-2$ ✓



a: distance from HA to new y-int

$a=7$

OR.

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

Sub a point $(0,5)$

$5=a(3^0)-2$

$5=a-2$

$a=7$

$y=7(3^x)-2$

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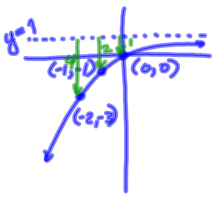
Ex.2

HA: $y=1$

$\rightarrow q=1$.



ratio of consecutive points

→ $\Delta x=1$

→ read from L to R

$d_1=4$ $d_2=2$ $d_3=1$

ratios: $\frac{d_2}{d_1}=\frac{2}{4}=\frac{1}{2}$ $\quad \frac{d_3}{d_2}=\frac{1}{2}$

$b=\frac{1}{2}$ $\quad y=a(b)^x+q$

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

Sub any point $(0,0)$

$0=a\left(\frac{1}{2}\right)^0+1$

$0=a+1$

$a=-1$

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

to verify, sub any x-value, check y-value vs. graph.

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1. $b=2$ HA: $y=4 \rightarrow q=4$

point $(2,10)$

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

sub $(2,10)$ (x, y)

$$10 = a(2)^2 + 4$$
$$6 = 4a$$
$$a = \frac{6}{4}$$
$$a = \frac{3}{2} \qquad y = \frac{3}{2}(2)^x + 4$$

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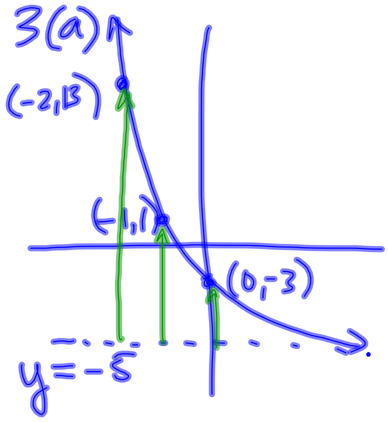
3(a)



$q = -5$

$d_1 = 18$ $\quad \frac{d_2}{d_1} = \frac{6}{18} = \frac{1}{3}$

$d_2 = 6$

$d_3 = 2$ $\quad \frac{d_3}{d_2} = \frac{2}{6} = \frac{1}{3}$

$b = \frac{1}{3}$

$$y = a\left(\frac{1}{3}\right)^x - 5$$

sub $(0,-3)$

$$-3 = a(1) - 5$$
$$2 = a \qquad \therefore y = 2\left(\frac{1}{3}\right)^x - 5$$

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