Graphing by transforming a basic function.

$g(x) = 3 \cdot 5^{7x+21} - 11$

* $h(x) = 3 \cdot \log_5(7x+21) - 11$

$j(x) = 3(7x+21)^{1/3} - 11$

$k(x) = 3(7x+21)^3 - 11$

0. $f(x) = \log_5(x)$
1.
2.
3.
4.

Solve

$2^{x^2-8} \cdot 2^{-3x} = 4$

$\log_{12}(x-2) + \log_{12}(x-1) = 1$

$h(x) = 3\cdot\log_5(7x+21) - 11$

$\frac{5}{7} - 3 = \frac{5-21}{7} = -\frac{16}{7}$

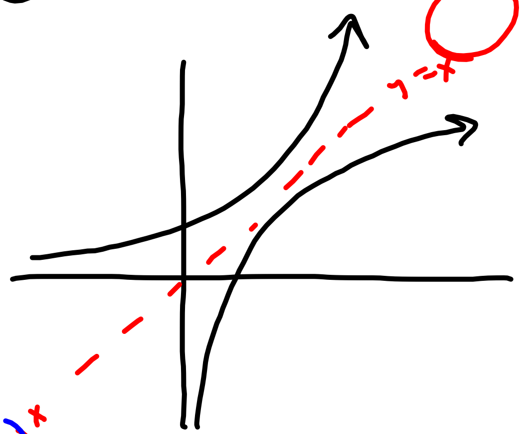
(0) $f(x) = \log_5(x)$ $(5, 1)$

(1) $3f(x) = 3\log_5(x)$ $y \longmapsto 3y$ $(5, 3)$

(2) $3f(7x) = 3\log_5(7x)$ $x \longmapsto \frac{1}{7}x$ $(5/7, 3)$

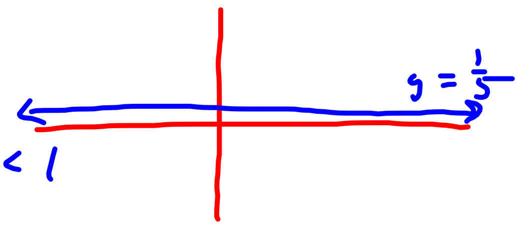
(3) $3f(7(x+3)) = 3\log_5(7(x+3))$ $x \longmapsto x-3$ $(-\frac{16}{7}, 3)$

(4) $3f(7(x+3)) - 11 = 3\log_5(7(x+3)) - 11$ $y \longmapsto y-11$ $(-\frac{16}{7}, -8)$

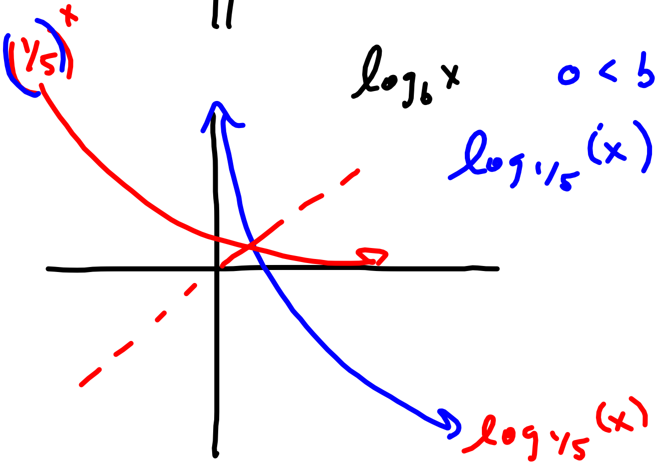


$\log_b x,\ b > 1$

$y = \frac{1}{5}^x = \frac{(1)^x}{(5)} = \frac{1}{5}$



$\log_b x \quad 0 < b < 1$



Scratch:

$7x+21 = 7\cdot(x+3)$

(0) $f(x) = x^{\frac{1}{3}}$

(1) $3f(x) = 3\cdot x^{\frac{1}{3}}$

(2) $3f(7x) = 3\cdot(7x)^{\frac{1}{3}}$

(3) $3f(7(x+3)) =$
$3(7(x+3))^{\frac{1}{3}}$

(4) $3f(7(x+3)) - 11$
$= 3(7(x+3))^{\frac{1}{3}} - 11$

§4.4 #16

$$4(1.02)^x = 3(1.03)^x$$

Usually, we want to isolate "the" exponential and hit it with a log. Here, you can't

$$3^2 \cdot 3^5 = 3^{2+5}$$

w1

$$(1.02)^x = \frac{3}{4}(1.03)^x$$

$$\log_{1.02}\left((1.02)^x\right) = \log_{1.02}\left(\frac{3}{4}(1.03)^x\right)$$

$$x = \log_{1.02}\left(\frac{3}{4}\right) + \log_{1.02}\left((1.03)^x\right)$$

$$x = \log_{1.02}\left(\frac{3}{4}\right) + \left(\log_{1.02}(1.03)\right)x$$

$$x = A + Bx$$

$$x - Bx = A$$

ln

log

$$x(1-B) = A$$

$$x = \frac{A}{1-B} = \frac{\log_{1.02}(3) - \log_{1.02}(4)}{1 - \log_{1.02}(1.03)}$$

For Emma

$$= \frac{\frac{\log(3)}{\log(1.02)} - \frac{\log(4)}{\log(1.02)}}{1 - \frac{\log(1.03)}{\log(1.02)}}$$

"Invert & multiply" saith the Lord.

$$= \frac{\frac{\log(3) - \log(4)}{\log(1.02)}}{\frac{\log(1.02) - \log(1.03)}{\log(1.02)}} = \boxed{\frac{\log 3 - \log 4}{\log 1.02 - \log 1.03}}$$

M2

$$4\cdot(1.02)^x = 3(1.03)^x$$

$$\log(4\cdot(1.02)^x) = \log(3(1.03)^x)$$

$$\log 4 + \log((1.02)^x) = \log 3 + \log((1.03)^x)$$

$$\log 4 + (\log(1.02))x = \log 3 + (\log(1.03))x$$

$$A + Bx = C + Dx$$

Turn ugly #s into symbols. Then manipulate the symbols.

$$Bx - Dx = C - A$$

$$(B-D)x = C-A$$

$$x = \frac{C-A}{B-D} = \frac{\log 3 - \log 4}{\log(1.02) - \log(1.03)}$$

Homework :

$$\mathrm{Min}\left(\frac{\text{Your points}}{(\text{possible pts})(.85)}, 100\right)$$

$2^{x^2-8} \cdot 2^{-3x} = 4$

M1 $2^{x^2-8-3x} = 4 = 2^2$

$x^2-3x-8 = 2$

$x^2-3x-10 = 0$

$(x-5)(x+2) = 10$

$x \in \{-2, 5\}$

$\log_{12}(x-2) + \log_{12}(x-1) = 1$

M2 $\log\left(2^{x^2-8} \cdot 2^{-3x}\right) = \log(4)$

$\log_2\left(2^{x^2-8} \cdot 2^{-3x}\right) = \log_2(4)$

$\log_2\left(2^{x^2-8}\right) + \log_2\left(2^{-3x}\right) = 2$

$x^2-8-3x = 2$

etc.

$\log_{12}(x-2) + \log_{12}(x-1) = 1$

$3^{2+5} = (3^2)(3^5)$

M1

$12^{\log_{12}(x-2) + \log_{12}(x-1)} = 12^1$

12 to the power of both sides.

$\left(12^{\log_{12}(x-2)}\right)\left(12^{\log_{12}(x-1)}\right) = 12$

$(x-2)(x-1) = 12$

~~$x-2=12$ or $x-1=12$~~

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

$x^2 - 3x - 10 = 0$

$(x-5)(x+2) = 0$

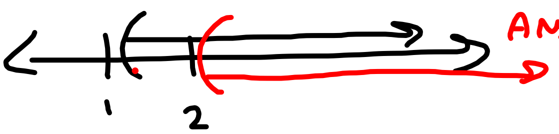
$x \in \{-2, 5\}$ CHECK (DOMAIN)

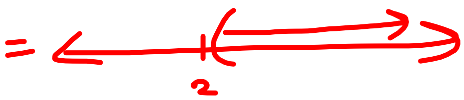
$-2 \notin \mathcal{D}$

$\underbrace{\log_{12}(x-2)} + \underbrace{\log_{12}(x-1)} = 1$

$x-2 > 0$ AND $x-1 > 0$

$x > 2$ $x > 1$





$= \{x \mid x > 2\}$

$= \boxed{(2, \infty) = \mathcal{D}}$

$\log_{12}(5-2) + \log_{12}(5-1) = 1$

$\log_{12}(3) + \log_{12}(4) = 1$

$\log_{12}(3 \cdot 4) = \log_{12}(12) = 1$

$\boxed{x \in \{5\}}$