$2^x = 3^{x-1}$

$\log_2(2^x) = \log_2(3^{x-1})$

$x = (x-1)\log_2(3)$

$x = x\log_2(3) - \log_2(3)$

$x - x\log_2(3) = -\log_2(3)$

$x - \log_2(3)\,x = -\log_2(3)$

$x(1 - \log_2(3)) = -\log_2(3)$

$x = \dfrac{-\log_2(3)}{1 - \log_2(3)}$ $\Longleftrightarrow$ $x = \dfrac{-1}{\log_3(2) - 1}$

$= \dfrac{-\frac{\ln(3)}{\ln(2)}}{1 - \frac{\ln(3)}{\ln(2)}}$

```
-ln(3)/ln(2)/(1-
ln(3)/ln(2))
     2.709511291
-1/(ln(2)/ln(3)-
1)
     2.709511291
```

$x - 5x = 7$

$x(1-5) = 7$

$-4x = 7$

$x = -\frac{7}{4}$

$\log_3(2^x) = \log_3(3^{x-1})$

$x\log_3(2) = x - 1$

$x\log_3(2) - x = -1$

$x(\log_3(2) - 1) = -1$

Mar 25-8:54 AM

$$2^x = 3^{x-1}$$

$$\ln(2^x) = \ln(3^{x-1})$$

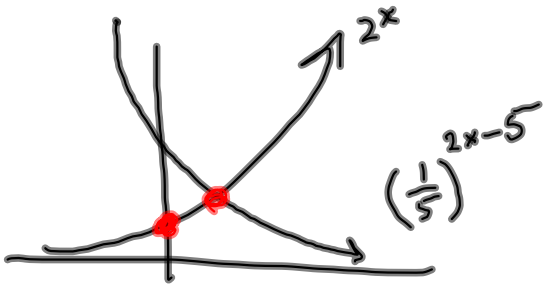
$$x\ln(2) = (x-1)\ln(3) = \ln(3)x - \ln(3)$$

$$\ln(2)x - \ln(3)x = -\ln(3)$$

$$(\ln(2) - \ln(3))x = -\ln(3)$$

$$x = \frac{-\ln(3)}{\ln(2) - \ln(3)}$$

```
      2.709511291
-1/(ln(2)/ln(3)-
1)
      2.709511291
-ln(3)/(ln(2)-ln
(3))
      2.709511291
```



$\left(\frac{1}{5}\right)^{2\left(x-\frac{5}{2}\right)}$ → Move right $\frac{5}{2}$

$\frac{1}{2}$ times x-values

$2^x = \left(\frac{1}{5}\right)^{2x-5} = 5^{5-2x}$

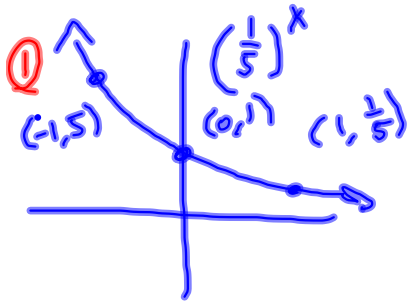
$f(x) = \left(\frac{1}{5}\right)^x \Rightarrow$ $\ln(2)x = \ln(5)(5-2x)$

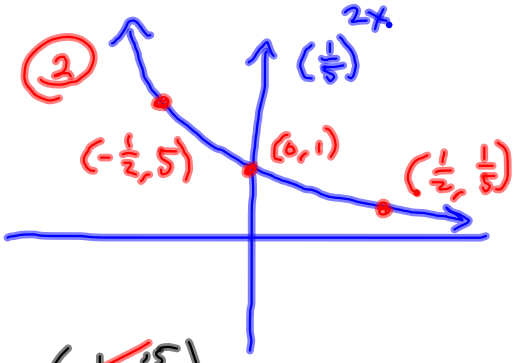
$\left(\frac{1}{5}\right)^{2x-5} = \left(\frac{1}{5}\right)^{2\left(x-\frac{5}{2}\right)} = f\left(2\left(x-\frac{5}{2}\right)\right)$

2.057040455
2.057040

① $\left(\frac{1}{5}\right)^x$ → ② $\left(\frac{1}{5}\right)^{2x}$ → $\left(\frac{1}{5}\right)^{2\left(x-\frac{5}{2}\right)}$

① $f(x)$ ② $f(2x)$ $f\left(2\left(x-\frac{5}{2}\right)\right)$





$\left(-\frac{1}{2},5\right) \to \left(-\frac{1}{2},5+\frac{5}{2}\right) = \left(-\frac{1}{2},\frac{15}{2}\right)$

$(0,1) \to \left(0,1+\frac{5}{2}\right)$

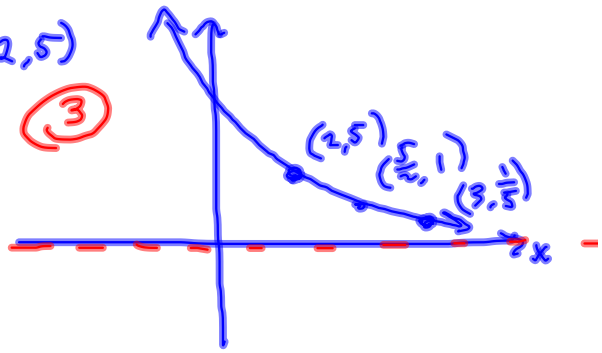
$\left(\frac{1}{2},\frac{1}{5}\right) \to \left(\frac{1}{2},\frac{1}{5}+\frac{5}{2}\right)$

No. Right $\frac{5}{2}$, not Up $\frac{5}{2}$, idiot.

$\left(-\frac{1}{2},5\right) \to \left(-\frac{1}{2}+\frac{5}{2},5\right) = (2,5)$

$(0,1) \to \left(\frac{5}{2},1\right)$

$\left(\frac{1}{2},\frac{1}{5}\right) \to \left(3,\frac{1}{5}\right)$



$2^x = \left(\frac{1}{5}\right)^{2x-5} = 5^{5-2x}$

$\ln(2)x = \ln(5)(5-2x)$

$x\ln(2) = 5\ln(5) - 2x\ln(5)$

$x\ln(2) + 2x\ln(5) = 5\ln(5)$

$(\ln(2) + 2\ln(5))x = 5\ln(5)$

$x = \frac{5\ln(5)}{(\ln(2)+2\ln(5))}$

Let $a = \ln(2)$, $b = \ln(5)$ } A timely substitution

$ax = b(5-2x)$

$ax = 5b - 2bx$

$ax + 2bx = 5b$

$(a+2b)x = 5b$

$x = \frac{5b}{a+2b}$

$= \frac{5\ln(5)}{\ln(2)+2\ln(5)}$

$500(1.06)^x = 400(1.02)^{4x}$

$\ln(ab) = \ln(a) + \ln(b)$

$1.06^x = \frac{4}{5}(1.02)^{4x}$

Divide by 500 to get one nekkid exponential, at least.

$\ln(1.06^x) = \ln\left(\frac{4}{5}(1.02)^{4x}\right)$

$= \ln\left(\frac{4}{5}\right) + \ln(1.02^{4x})$

$\ln(1.06)\,x = \ln\left(\frac{4}{5}\right) + \ln(1.02)\cdot 4x \Rightarrow$

$ax = b + cx$, where $a = \ln(1.06)$

$b = \ln\left(\frac{4}{5}\right)$

$(a-c)x = b$

$c = 4\ln(1.02)$

$x = \frac{b}{a-c} = \frac{(\ln 4 - \ln 5)}{(\ln(1.06) - 4\ln(1.02))}$

$\log_2(x+2) + \log_2(x-2) = 5$

$2^{\log_2((x+2)(x-2))} = 2^5$

$(x+2)(x-2) = 32$

$x^2 - 2x + 2x - 4 = 32$

$x^2 - 4 = 32$

$x^2 = 36$

$x = \pm 6$

$x = -6 \notin D$

$\{6\}$

Check:

$\log_2(8) + \log_2(4)$

$= 3 + 2 = 5$ ✓

$x = -6$:

$\log_2(-4)$

$\log_3(x-6) - \log_3(2x) = 4$

$\log_3((x-6)(2x)) = 4$ Nope

$3^{\log_3\left(\frac{x-6}{2x}\right)} = 3^4$

$\frac{x-6}{2x} = 81$

$x-6 = 162x$

$-6 = 161x$

$\frac{-6}{161} = x$