10/29

Sunday, October 29, 2017 7:55 PM

Solve:

- $5^{7x+2} = 2^{x-5}$

$$5^{7x} \cdot 5^2 = \frac{2^x}{2^5}$$

$$5^{7x} \cdot 25 = \frac{2^x}{2^5} \quad // \ln$$

$$\ln\left(5^{7x} \cdot 25\right) = \ln\left(\frac{2^x}{2^5}\right)$$

$$\ln\left(5^{7x}\right) + \ln 25 = \ln 2^x - \ln 2^5$$

$$7x \ln 5 + \ln 25 = x \ln 2 - 5 \ln 2$$

$$7x \ln 5 - x \ln 2 = -\ln 25 - 5 \ln 2$$

$$x(7 \ln 5 - \ln 2) = -2 \ln 5 - 5 \ln 2$$

$$x = \boxed{\frac{-2\ln 5 - 5\ln 2}{7\ln 5 - \ln 2}} = \boxed{\frac{2\ln 5 + 5\ln 2}{-7\ln 5 + \ln 2}}$$

"$\frac{2}{2} = \frac{-2}{-2}$"

Rule:

$$x^{a+b} = x^a \cdot x^b$$

$$x^{a-b} = \frac{x^a}{x^b}$$

// ln

$$\ln\left(5^{7x+2}\right) = \ln\left(2^{x-5}\right)$$

$$(7x+2)\ln 5 = (x-5)\ln 2$$

- $e^{4x} - 7e^{2x} - 44 = 0$

$$e^{2 \cdot 2x} - 7e^{2x} - 44 = 0$$

$$\left(e^{2x}\right)^2 - 7\left(e^{2x}\right) - 44 = 0$$

$u = e^{2x}$

$u^2 - 7u - 44 = 0$

$u = e$

$u^2 - 7u - 44 = 0$

$(u+4)(u-11) = 0$

$u = -4$

$e^{2x} = -4$

$\ln e^{2x} = \ln -4$

$2x \ln e = \ln(-4)$

$2x = \ln(-4)$ Does not exist

none

$u = 11$

$e^{2x} = 11$

$2x = \ln 11$

$x = \frac{\ln 11}{2}$

$$\boxed{x = \frac{\ln 11}{2}}$$

- $3^{1-5x} = 5^x$

$\ln 3^{1-5x} = \ln 5^x$

$(1-5x)\ln 3 = x \ln 5$

$\ln 3 - 5x \ln 3 = x \ln 5$

$-x \ln 5 - 5x \ln 3 = -\ln 3$

$x(-\ln 5 - 5\ln 3) = -\ln 3$

$$x = \boxed{\frac{-\ln 3}{-\ln 5 - 5\ln 3}} \cdot \frac{-1}{-1} = \boxed{\frac{\ln 3}{\ln 5 + 5\ln 3}}$$

- $7^{2x} + 7^x - 42 = 0$

- $7^{2x}+7^{x}-42=0$

$(7^{x})^{2}+(7^{x})-42=0$

$\underline{u=7^{x}}$

$u^{2}+u-42=0$

$(u-6)(u+7)=0$

$u-6=0$ $\qquad$ $u+7=0$

$u=6$ $\qquad$ $u=-7$

$7^{x}=6$ $\qquad$ $7^{x}=-7$

$x\ln 7=\ln 6$ $\qquad$ $x\ln 7=\ln -7$

$\qquad$ $\underline{\text{none}}$

$x=\frac{\ln 6}{\ln 7}=\boxed{\log_7 6}$

Simplify: $10^{\log 30-\log 5}=\frac{10^{\log 30}}{10^{\log 5}}$ $\qquad$ $\boxed{b^{\log_b x}=x}$

$=\frac{10^{\log_{10} 30}}{10^{\log_{10} 5}}$

$=\frac{30}{5}=\boxed{6}$

<u>Solve:</u>

- $5e^{5x}=2195$

$e^{5x}=\frac{2195}{5}$

$$e^{5x} = 439 \quad // \ln$$

$$\ln e^{5x} = \ln 439$$

$$5x = \ln 439$$

$$x = \boxed{\frac{\ln 439}{5}}$$

- $3^{2x} + 3^{x+1} - 40 = 0$

$$(3^x)^2 + 3^{x+1} - 40 = 0$$

$$(3^x)^2 + 3^x \cdot 3^1 - 40 = 0$$

$$(3^x)^2 + 3 \cdot (3^x) - 40 = 0$$

$u = 3^x$

$$u^2 + 3u - 40 = 0$$

$\vdots$

Simplify to one log:

$$2 \ln(5x+3) - 5\ln(x-3) - 4\ln x$$

$$= \ln\left[(5x+3)^2\right] - \ln\left[(x-3)^5\right] - \ln x^4$$

$$\boxed{\begin{array}{l} \ln A + \ln B = \ln AB \\ \ln A - \ln B = \ln \frac{A}{B} \end{array}}$$

$$= \ln\left[\frac{(5x+3)^2}{(x-3)^5}\right] - \ln x^4$$

$$= \ln\left[\frac{(5x+3)^2}{(x-3)^5} \cdot \frac{1}{x^4}\right] = \boxed{\ln\left[\frac{(5x+3)^2}{(x-3)^5 x^4}\right]}$$

$$= \boxed{\ln\left[\frac{(5x+3)^2}{x^4(x-3)^5}\right]}$$

Solve:

$$\ln(x-6) + \ln(x+1) = \ln(x-15)$$

$$\ln((x-6)\cdot(x+1)) = \ln(x-15)$$

$$\ln(x^2-5x-6) = \ln(x-15)$$

$$\downarrow$$

$$x^2 - 5x - 6 = x - 15$$

$$x^2 - 6x + 9 = 0$$

$$(x-3)(x-3) = 0$$

$\underline{x=3} \longrightarrow$ test: $\ln(3-6)+\ln(3+1)=\ln(3-15)$

$\ln(-3)+\ln(4)=\ln(-12)$

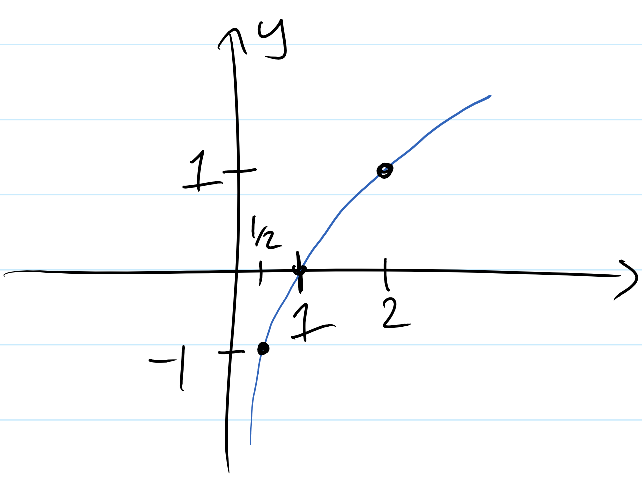
not a solution

b/c -3 is not in the domain of $\ln(x)$

$\boxed{\text{There is no solution}}$

Plot: $y=\log_2(-x+2)$

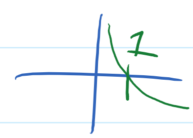
$\log_2(x) \longrightarrow$ hor. shift left by 2 $\log_2(x+2) \longrightarrow$ reflection about the y-axis $\log_2(-x+2)$



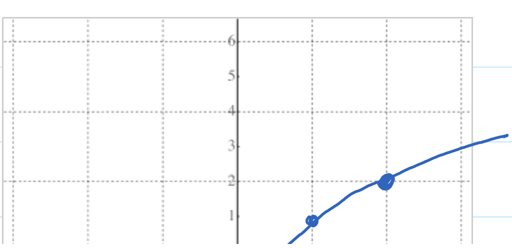
$$\begin{cases} \log_b b = 1 \\ \log_2 2 = 1 \end{cases}$$

$$\begin{cases} \log_b \frac{1}{b} = \log_b b^{-1} = -1 \\ \log_2 \frac{1}{2} = -1 \end{cases}$$

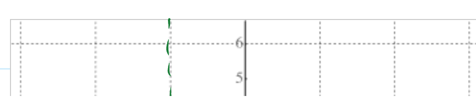
$\log_{\frac{1}{3}} x$

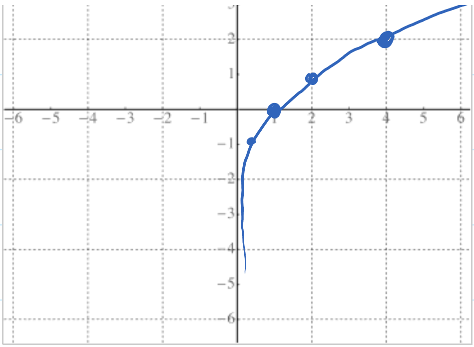


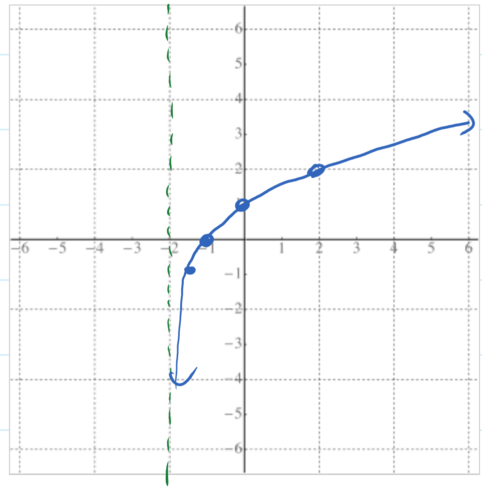
$y=\log_2 x$



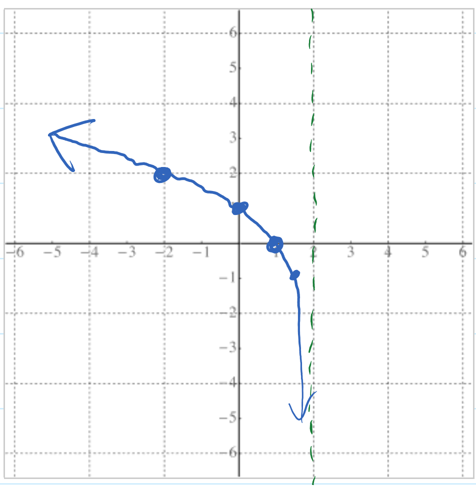
$y=\log_2(x+2)$







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



Solve:

- $9(4^{7x}) = 2$

$$\frac{9 \cdot 4^{7x}}{9} = \frac{2}{9}$$

$$4^{7x} = 2/9$$

$\vdots$

- $5^{x-2} = 4^{2x+3}$

$(x-2)\ln 5 = (2x+3)\ln 4$

$\vdots$

Find domain of $\log(x^4+x^3-x^2+x-2)$

need to solve: $x^4+x^3-x^2+x-2>0$