10/25

Wednesday, October 25, 2017 10:16 AM

- Final exam on Wednesday 12/13, 5-7PM.
  Send me an email this week if you have travel plans and need to take the exam sooner. The exam will be on Saturday 12/9, 10AM-12PM.

- Online office hour on Sunday at 8PM

- MMC CP 145 on Saturday 10/28, 10am-12pm

Section 4.4

Exponential Equation is an equation containing a variable in an exponent.

$3^x = 15$	$2^x = 2^{5x-1}$	$2^4 = x^4$	$2^x = (x-2)^2$
✓	✓	X	X

Solve:

- $2^{3x-8} = 16$

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

$$3x - 8 = 4$$

$$3x = 12$$

$$\boxed{x = 4}$$

If $b^M = b^N$ then $M = N$.

Solve:

$$27^{x+3} = 9^{x-1}$$

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

$$3^{3x+9} = 3^{2x-2}$$

$$3x + 9 = 2x - 2$$

$$3x - 2x = -2 - 9$$

$$\boxed{x = -11}$$

- $5^{3x-6} = 125$

$$5^{3x-6} = 5^3$$

$5^{3x-6} = 5^{3}$

$3x-6=3$

$3x=9$

$\boxed{x=3}$

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

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

$2^{3x+6} = 2^{2x-6}$

$3x+6 = 2x-6$

$3x-2x = -6-6$

$\boxed{x=-12}$

Solve: $4^x = 15$

take $\log_b$ of both sides

$\ln 4^x = \ln 15$

$\frac{x \ln 4}{\ln 4} = \frac{\ln 15}{\ln 4}$

$\log_b a = \frac{\log_c a}{\log_c b}$

$$x = \frac{\ln 15}{\ln 4} = \boxed{\log_4 15}$$

- $10^x = 120000$

$$\log_4 10^x = \log_4 120000$$

$$x \log_4 10 = \log_4 120000$$

$$x = \frac{\log_4 120000}{\log_4 10}$$

$$x = \boxed{\log_{10} 120000} \approx 5.08$$

$10^x = 12 \cdot 10^4$

$\log 10^x = \log (12 \cdot 10^4)$

$x \log 10 = \log 12 + \log 10^4$

$x = \log 12 + 4$

$x = \boxed{4 + \log 12}$

$\approx 4 + 1.08 = 5.08$

Solve:

$$40e^{0.6x} - 3 = 237$$

separate $e^{0.6x}$

$$\frac{40e^{0.6x}}{40} = \frac{240}{40}$$

$$e^{0.6x} = 6$$

$\ln(..) = \ln(..)$

$e^{0.6x} = 6$ $\quad \ln(\cdot\cdot) = \ln(\cdot\cdot)$

$\ln e^{0.6x} = \ln 6$

$\frac{0.6x \cdot 1}{0.6} = \frac{\ln 6}{0.6}$

$\log..$

$x = \boxed{\frac{\ln 6}{0.6}} = \frac{\ln 6}{\frac{6}{10}} = \frac{\ln 6}{1} \cdot \frac{10}{6} = \boxed{\frac{5}{3}\ln 6}$

$\frac{0.6x \log e}{0.6 \log e} = \frac{\log 6}{0.6 \log e}$

$x = \frac{\log 6}{0.6 \log e} = \frac{5}{3} \cdot \frac{\log 6}{\log e}$

- $5^{x-2} = 4^{2x+3}$ $\quad \log_b(\cdot\cdot) = \log_b(\cdot\cdot)$

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

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

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

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

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

$$x = \boxed{\frac{2\ln 5 + 3\ln 4}{\ln 5 - 2\ln 4}} = \frac{\ln 5^2 + \ln 4^3}{\ln 5 - \ln 4^2}$$

$$= \frac{\ln(5^2 \cdot 4^3)}{\ln\left(5/4^2\right)}$$

$e^{2x} = e^x \cdot e^x$

Solve: $e^{2x} - 4e^x + 3 = 0 \longrightarrow e^{2x} - 4e^x = -3$

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

$(e^x)^2 - 4(e^x) + 3 = 0$

$t = e^x$

$t^2 - 4t + 3 = 0$

$(t-3)(t-1) = 0$

$t = 3, 1$

$t = 3$ $\qquad$ $t = 1$

$e^x = 3$ $\qquad$ $e^x = 1$

$\ln e^x = \ln 3$ $\qquad$ $\ln e^x = \ln 1$

$\boxed{x = \ln 3}$ $\qquad$ $x = \ln 1$

$\boxed{x = 0}$

Solve:

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

Solve:

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

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

$$u=3^{x}$$

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

$$(u-1)(u+2)=0$$

$u=1$

$3^{x}=1$

$\log_3 3^{x}=\log_3 1$

$\boxed{x=0}$

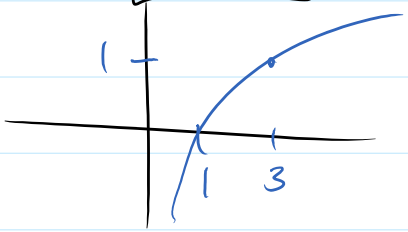
$u=-2$

$3^{x}=-2$

$x\log_3 3=\log_3 -2$

$x=\log_3(-2)$

no sol



The only solution is $x=0$