$5^{2x} + 5^{x} - 42 = 0$ is quadratic in form

$(5^{x})^2 + 5^{x} - 42 = 0$

$2x = 2 \cdot x = x \cdot 2$

$5^{2x} = 5^{x \cdot 2} = (5^{x})^2$

Let $u = 5^{x} \longrightarrow$

$u^2 + u - 42 = 0$

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

$u = -7$ OR $u = 6$

$5^{x} = -7$ $\quad$ $5^{x} = 6$

$\cancel{}$ $\quad$ $\log_5(5^{x}) = \log_5(6) = \dfrac{\ln(6)}{\ln(5)} = x$

≈ 1.113282753

Alternate

$\ln(5^{x}) = \ln(6)$

$\ln(5)\,x = \ln(6)$

$\dfrac{\ln(5)\,x}{\ln(5)} = \dfrac{\ln(6)}{\ln(5)}$

$x = \dfrac{\ln(6)}{\ln(5)}$

$\log(5^{x}) = \log(6)$

$x \log(5) = \log(6)$

$x = \dfrac{\log(6)}{\log(5)}$

Report on Work Done

MONDAY & WEDNESDAY

Share your team's work with other 5 teams

obtain Work from other 5 teams.

Put together report on the whole deal.

Monday: Quadratics (2nd-degree)

Wednesday: Higher-degree polynomials

Teams 1,3,5 : >0, <0

2,4,6 : ≥ 0, ≤ 0

Finally GRAPH them.

§3.3 II Bonus Assignment

s 43, 47, 51, 61, 65, 67, 69*, 70☆

☆ Quadratic in form

* Multiplicities not = 1.

Solutions are posted!

Analyze $x^3+2x^2-2x-4=f(x)$
like we did on Wednesday
plus GRAPHS
and $<, \leq, >, \geq 0$ questions.

$x^3+2x^2-2x-4=0 \Rightarrow \dots \Rightarrow \boxed{x=-2, \pm\sqrt{2}}$

$$\begin{array}{r|rrrr} -2 & 1 & 2 & -2 & -4 \\ & & -2 & 0 & 4 \\ \hline & 1 & 0 & -2 & 0 \end{array}$$

$f(x)=(x+2)(x^2-2)$

$x^2-2=0$

$(x-\sqrt{2})(x+\sqrt{2})=0$

$x=\pm\sqrt{2}$

$x^2=2$

$x=\pm\sqrt{2}$

$a=1, b=0, c=-2$

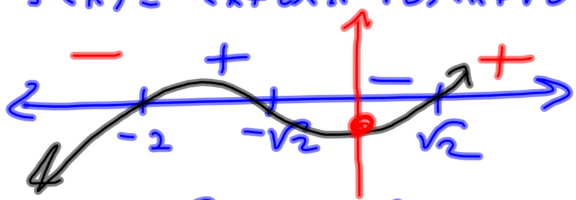
$b^2-4ac=0^2-4(1)(-2)$

$=8$

$\rightsquigarrow \sqrt{8}=\sqrt{4}\sqrt{2}=2\sqrt{2}$

$x=\frac{\pm 2\sqrt{2}}{2(1)}=\pm\sqrt{2}$

$f(x)=(x+2)^1(x-\sqrt{2})^1(x+\sqrt{2})^1$



EB: x^3

cody

$f(0)=-4 \rightsquigarrow (0,-4)$

$f(x)>0$

$(-2,-\sqrt{2})\cup(\sqrt{2},\infty)$

$f(x)\geq 0$

$[-2,-\sqrt{2}]\cup[\sqrt{2},\infty)$

$f(x)<0$

$(-\infty,-2)\cup(-\sqrt{2},\sqrt{2})$

$f(x)\leq 0$

$(-\infty,-2]\cup[-\sqrt{2},\sqrt{2}]$

Nonreal zeros have NO EXPRESSION or MANIFESTATION in the graph.

1. $\log(x) + \log(x-48) = 2$
2. $\log_2(x+14) + \log_2(x+18) = 5$
3. $\log_8(x+6) + \log_8(x+3) = 2$
4. $\log(x-1) - \log(x+8) = \log(x-6) - \log(x+9)$
5. $5^{-x} = 2.1$
6. $3^x = 7$
7. $5^{7x} = \frac{1}{3}$

Nov 13-7:44 AM

$\log(-2) \notin \mathbb{R}$

1. $\log(x) + \log(x-48) = 2$

$\log(x(x-48)) = 2$

$10^{\log(x(x-48))} = 10^2$

$x^2 - 48x = 100$

$x^2 - 48x - 100 = 0$

$(x-50)(x+2) = 0$

$\boxed{x = -2, 50}$

$-2 \notin D \Longrightarrow$

$x = 50$ is Final answer.

$x = -2$ is an extraneous root.

$$\begin{array}{r} 24 \\ 24 \\ \hline 96 \\ 48 \\ \hline 576 \end{array}$$

$$\begin{array}{r|l} 2 & 676 \\ 2 & 338 \\ 13 & 169 \\ & 13 \end{array}$$

$x^2 - 48x = 100$

$x^2 - 48x + (24)^2 = 100 + 576$

$(x-24)^2 = 676$

$\sqrt{676} = \sqrt{2^2 \cdot 13^2} = 2 \cdot 13 = 26$

$x - 24 = \pm\sqrt{676} = \pm 26$

$x = 24 \pm 26 \to 50,\ -2$

Nov 15-8:26 AM

$\log(x) = \log(y) \iff x = y$

(4) $\log(x-1) - \log(x+8) = \log(x-6) - \log(x+9)$

!

$$\log\left(\frac{x-1}{x+8}\right) = \log\left(\frac{x-6}{x+9}\right)$$

$$\frac{x-1}{x+8} = \frac{x-6}{x+9}$$

(1)

$$(x-1)(x+9) = (x-6)(x+8)$$

$$x^2+8x-9 = x^2+2x-48$$

Shiloh

$$8x-9 = 2x-48$$

$$6x = -39$$

$$x = -\frac{39}{6} = \boxed{-\frac{13}{2} = x}$$

But $-\frac{13}{2} \notin D$

(2)

$$\frac{x-1}{x+8} = \frac{x-6}{x+9}$$

$$\left(\frac{x-1}{x+8}\right)\left(\frac{x+9}{x+9}\right) - \left(\frac{x-6}{x+9}\right)\left(\frac{x+8}{x+8}\right) = 0$$

$$\frac{x^2+8x-9-(x^2+2x-48)}{(x+9)(x+8)} = 0$$

LCD $= (x+9)(x+8)$

$$\frac{8x-9-2x+48}{LCD} = 0$$

Madison

$$\boxed{\frac{6x+39}{LCD}} = 0$$

$6x+39=0$ etc.

Why Method (2) Ever? INEQUALITIES

$$\log\left(\frac{x-1}{x+8}\right) < \log\left(\frac{x-6}{x+9}\right)$$

Log(x) is an increasing function of x.

$$\frac{x-1}{x+8} < \frac{x-6}{x+9}$$

$\vdots$

$$\frac{6x+39}{(x+8)(x+9)} = \frac{6\left(x+\frac{13}{2}\right)}{(x+8)(x+9)} < 0$$

$$6\left(x+\tfrac{13}{2}\right)(x+8)(x+9) < 0$$

EB: $6x^3$

$-$ $+$ $-$ $+$

-9 -8 $-\frac{13}{2}$

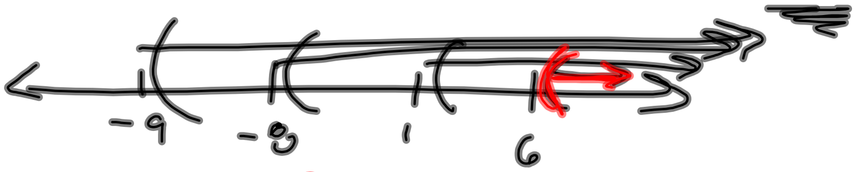
This is the same as the sign pattern for $\frac{6\left(x+\frac{13}{2}\right)}{(x+8)(x+9)}$. only difference is $x=-8,-9$ are verboten.

$x \in (-\infty, -9) \cup (-8, -\frac{13}{2})$

There's a problem with this.
The domain of the problem

(4) $\log(x-1) - \log(x+8) = \log(x-6) - \log(x+9)$

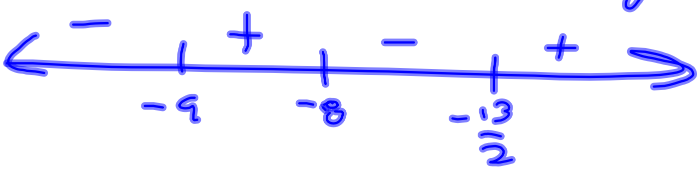
Need $x > 1$ and $x > -8$ and $\underline{x > 6}$ and $x > -9$



$\mathcal{D} = (6, \infty)$

Conclude: No Solution!

What about "≥ 0" question?



$x \in (-9,-8) \cup [-\frac{13}{2}, \infty)$

But $x > 6$ required :

$\therefore$ $\boxed{x \geq 6}$

Next time:

Geometric Sums

$1 + r + r^2 + \dots + r^{n-1} = \frac{r^n - 1}{r-1}$

$1 + 2 + 2^2 + \dots + 2^{n-1} = \frac{2^n - 1}{2-1}$

$1 + 2 + 2^2 + 2^3 + 2^4 + 2^5 + 2^6 = 127$

$n-1=6 \Longrightarrow n=7$

$\frac{2^7 - 1}{2-1} = \frac{128-1}{2-1} = 127$

This is all about Annuities

Team #1 $2+3i$

$x^4 - 11x^3 + 35x^2 - 7x - 54$

* Team #2

$2x^4 - 13x^3 + 36x^2 - 43x + 14$

* Team #3

$3x^4 - 13x^3 + 30x^2 - 36x + 16$

Team #4

$x^4 - 7x^3 + 25x^2 - 41x + 22$

Team #5

$x^4 - 10x^3 + 36x^2 - 62x + 35$

Team #6

$x^4 + 2x^3 - 8x^2 + 6x + 63$

1. Find all real zeros
2. Factor over field of real numbers.
3. Find the rest of the zeros (nonreal complex)
4. Factor over the field of complex numbers.

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(1) Rational Zeros

(2) Descartes' Rule

(3) Synthetic Division Guesses

(4) Repeat, on depressed equation.

Nov 13-7:53 AM