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LOGARITHMIC INEQUALITIES CONTAINED OF VARIABLES SOME PROPERTIES USING INEQUALITIES SOLVING

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Annotation
This in the article Logarithmic inequalities contained of variables some properties using inequalities solve about scientific affairs take going , Logarithmic inequalities of solving one how much methods there is Some cases below shown from the method use much efficiency situation showing to give implied .

Keywords: Inequality, variable, method, definition area, solution , property , system .

Logarithmic inequalities of solving one how much methods there is Some cases below shown from the method use much efficient will be

1. $\log_c a - \log_c b$ expression $a>0,\ b>0,\ c>1$ at $a-b$ expression with one different to the hint have _ Indeed ,

$$\log_c a - \log_c b = \log_c \frac{a}{b} > 0$$

to be for $\frac{a}{b} > 1$ or $a-b>0$ to be need _

$$\log_c a - \log_c b = \log_c \frac{a}{b} < 0$$

to be for $0 < \frac{a}{b} < 1$, from this $a-b<0$ to be come comes out

2. $\log_c a - \log_c b$ expression $a>0,\ b>0, 0<c<1$ when $a-b$ expression with opposite to the hint have will be

Proof : $\log_c a - \log_c b = \log_c \frac{a}{b} > 0$ to be for $0 < \frac{a}{b} < 1$, from this $a-b<0$ to be come comes out

$\log_c a - \log_c b = \log_c \frac{a}{b} < 0$ to be for $\frac{a}{b} > 1, a-b>0$ to be need _

3. If $a>0,\ b>0, c>1$ if _ $\log_c a - \log_c b$ expression $ab-1$ expression with one different to the hint have will be Indeed _ $\log_c ab > 0$ to be for $ab>1$ or $ab-1>0$ to be need _ $\log_c ab < 0$ without $ab-1<0$ the harvest we do

4. If $a>0,\ b>0, 0<c<1$ if _ $\log_c a - \log_c b$ and $ab-1$ expressions opposite pointed will be

5. $\log_c a$ and $a-1$ expressions $a>0, c>1$ when one different pointed , $a>0, 0<c<1$ when each different pointed will be

Now this to confirmations examples we bring

Example 1. This

$$\lg(x-4)+\lg x<\lg 21$$

inequality take off

Solution : of the inequality identification field $x>4$ from consists of Inequality to him equal to strong was _ inequality with we will exchange .

$$\lg(x-4)+\lg\frac{x}{21}<0$$

By property 3 _

$$(x-4)\frac{x}{21}-1<0$$

inequality we solve .

$$\begin{cases}x^2-4x-21<0\\x>4\end{cases}\Rightarrow\quad\begin{cases}(x-7)(x+3)<0\\x>4\end{cases}\Rightarrow\quad\begin{cases}-3<x<7\\x>4\end{cases}\Rightarrow(4,7).$$

Answer :(4;7)

Example 2 . This

$$2\log_4 x-\frac{1}{2}\log_2\left(x^2-3x+2\right)\le-\frac{1}{2}$$

inequality take off

Solution : Given inequality to him equal to strong was _ inequality with we will exchange .

$$\begin{cases}x>0,\\x^2-3x+2>0,\\\log_2 x^2-\log_2\left(x^2-3x+2\right)\le-1\end{cases}$$

$$\log_2 2x^2-\log_2\left(x^2-3x+2\right)\le 0$$

According to property 1

$$2x^2-x^2+3x-2\le 0;\ \ x^2+3x-2\le 0.$$

The following the system we solve .

$$\begin{cases}x>0\\x^2-3x+2>0\\x^2+3x-2\le 0\end{cases}$$

Solution of the 2nd inequality of the system $x\in(-\infty;1)\cup(2;\infty)$ from consists of Same as well as the solution of inequality 3 $x\in\left[\frac{-3-\sqrt{17}}{2};\frac{-3+\sqrt{17}}{2}\right]$ the harvest we do Consider inequality 1 of the system take the following harvest we do (Figure 1)

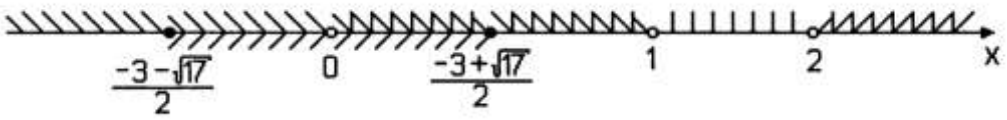

Figure 1

Answer : $\left(0;\frac{-3+\sqrt{17}}{2}\right]$

3-m isol. This

$\log_3\sqrt{5-2x}\cdot\log_x 3<1$

solve the inequality.

Solving . The domain of inequality

$\begin{cases}5-2x>0,\\ x>0,\\ x\neq 1\end{cases}<=>\begin{cases}x<2,5\\ x>0,\\ x\neq 1\end{cases}$ consists of So, $x\in(0;1)\cup(1;2,5)$

We write the inequality in the form $\frac{\log_3\sqrt{5-2x}}{\log_3 x}-1<0$ or . $\frac{\log_3\sqrt{5-2x}-\log_3 x}{\log_3 x}<0$ Using properties 1 and 2, $\frac{\sqrt{5-2x}-x}{x-1}<0$ we derive the inequality. We solve this inequality by the method of intervals. $f(x)=\frac{\sqrt{5-2x}-x}{x-1}$ we introduce the function $D(f):(-\infty;1)\cup(1;2,5)$. We find the zeros of the function. $\sqrt{5-2x}=x;\quad x^2+2x-5=0;\quad x=-1\pm\sqrt{6}.\quad x=-1-\sqrt{6}$ does not belong to the domain of the definition of inequality (Figure 2)

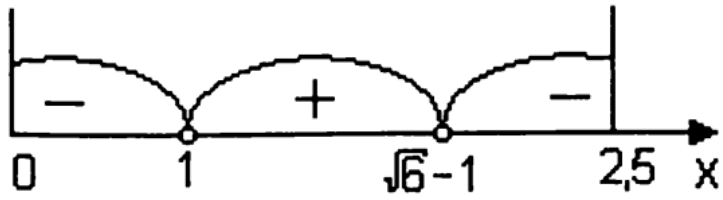

Figure 2

Answer J : $(0;1)\cup(\sqrt{6}-1;2,5)$

Example 4. This

$\frac{2}{\log_3(x+1)}\leq\frac{1}{\log_9(x+5)}$

solve the inequality.

Solving. Given inequality

$\frac{2}{\log_3(x+1)}-\frac{1}{\log_9(x+5)}\leq 0$ or $\frac{\log_3(x+5)-\log_3(x+1)}{\log_3(x+1)\log_3(x+5)}\leq 0$

as strong as inequality.

Using the 1st and 5th properties and taking into account the field of definition of the inequality, we form the following system of inequalities.

$$\begin{cases} \dfrac{x+5-x-1}{(x+1-1)(x+5-1)} \le 0 \\ x > -1 \end{cases} \Leftrightarrow \begin{cases} \dfrac{1}{x(x+4)} \le 0 \\ x > -1 \end{cases}$$

From this $-1 < x < 0$.

Answer : $(-1;0)$

Example 5. This

$$\frac{\lg(x^2-6x+8)}{\lg(x-8)} < 1$$

inequality take off

Solving . This of inequality identification field we find

$$\begin{cases} x^2-6x+8>0, \\ x>8, \\ x \ne 9 \end{cases} \Leftrightarrow \begin{cases} (x-2)(x-4)>0, \\ x>8, \\ x \ne 9. \end{cases}$$

$x>8$ at $(x-2)(x-4)>0$, therefore for $x \in (8;9) \cup (9;\infty)$. Given inequality to him equal to strong has been

$$\frac{\lg(x^2-6x+8)-\lg(x-8)}{\lg(x-8)} < 0$$

inequality with we will exchange . According to properties 1 and 5

$$\frac{x^2-6x+8-x+8}{x-8-1} < 0; \frac{x^2-7x+16}{x-9} < 0,$$

but $x^2-7x+16>0$ because $x-9<0, x<9$. We form the answer by taking into account the field of determination of the given inequality . $(8;9)$

Answer : $(8;9)$

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