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Rational Expressions Exactly Form Replacement

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Abstract: This article provides detailed theoretical examples and practical exercises about rational expressions and transformations on them.

Keywords: rational expressions, mathematical properties, theorems, natural numbers, etc.

Someone X(x_1, ..., x_n) is algebraic expression ***exactly replacement*** that, him, in general when , to X unlike so Y(x_1,..., x_n) is algebraic to expression replacement it is understood that all x 1 , ..., x_n in values Hwa Values equal to let it be

For example , $A(x)=\dfrac{(x^2+1)(x-1)(x+3)}{(x^2-1)(x+3)}$, $B(x)=\dfrac{x^2+1}{x+1}$, $C(x)=\dfrac{(x^2+1)(x-1)(x+3)}{(x^2-1)(x+3)}$ expression A(x) from for all values $x \neq -1$, $x \neq 1$, expression B(x) for values $x \neq -1$, and C(x) for values $x \neq 1$, $x \neq 1$, $x \neq -3$ determined . Their common availability area of values $x \neq \pm 1$, $x \neq -3$ consists of , then they are one different values acceptance they do , that is, ***exactly is equal*** .

General availability in the field one rational expression to him exactly equal to replace with an expression that's it expression ***exactly replacement*** is called

Exactly of substitutions equations solution, theorems and crimes to prove such as issues in solving is used. Exactly substitutions fractions shortening , parentheses open , general a lot the stalker from parentheses out release , similar terms condense and that's it from the like consists of will be Exactly exchange in trouble arithmetic of deeds properties is used .

The following crimes suitable for :

1) $(AB)^n = A^n B^n$

2) $A^m A^n = A^{m+n}$

3) $(A^m)^n = A^{mn}$

4) $\dfrac{A}{B}+\dfrac{C}{D}=\dfrac{AD+BC}{BD}, B \neq 0, D \neq 0.$

5) $\dfrac{A}{B}\cdot\dfrac{C}{D}=\dfrac{AC}{BD}, B \neq 0, D \neq 0.$

6) $\dfrac{A}{b}\div\dfrac{C}{D}=\dfrac{AD}{BC,}, B \neq 0, C \neq 0, D \neq 0$

7) $\dfrac{AC}{BC}=\dfrac{A}{B}, B \neq 0, C \neq 0$

8) $\dfrac{A^m}{A^n}=\begin{cases} A^{m-n}, m \succ n \\ 1, m=n, A \neq 0 \end{cases}$ **in;**

9) $|AB| = |A| \cdot |B|$

10) $|A^n| = |A|^n$

Rational of expressions canonical shape irreducible $\frac{P(x)}{Q(x)}$ from the fraction consists of will be Here P(x) and Q (x) are polynomials is , and Q(x) is a polynomial prime factor and x to 1 equal to

Example 2: $\frac{16-x^2}{2x^4+9} : \left(\frac{1}{x-3} - \frac{1}{x-3} * \frac{x-3}{2x+1} \right)$ rational expression canonical to look bring _

Solution : $\frac{1}{x-3}$ - $\frac{1}{x-3} * \frac{x-3}{2x+1} = \frac{x+4}{(x-3)(2x+1)}$,

$$\frac{16-x^2}{2x^4+9} : \left(\frac{x+4}{\{x-3\}\{2x+1\}} \right) = \frac{(4-x)(4+x)(x-3)(2x+1)}{(2x^4+9)(x+4)} = \frac{-2x^4+13x^2-17x-12}{2x^4+9} = \frac{-x^3+13/2x^2-17/2x-6}{x^4+9/2}.$$

2. Irrational expressions exactly form substitutions .

n- level arithmetic root _ Rational indicative degree _

a ≥ 0 is the nth power of the number ***arithmetic root*** as (n $\in$N), n- degree to a equal to to the number b ≥ 0 it is said and b= $\sqrt[n]{a}$ through is determined . Description by : ($\sqrt[n]{a}$) ^{n} = a .

a>0, m $\in$Z and n $\in$N if _ $\sqrt[n]{a^m}$ number of a ***r*** **=** $\frac{m}{n}$ ***rational indicative level*** is called , that is, **a** $^{\mathbf{r}}$ = $a^{\frac{m}{n}} = \sqrt[n]{a^m}$ **.**

In particular , $\sqrt[n]{a} = a^{\frac{1}{n}}$. Rational indicative degree ***characteristic s a 1 ar i*** whole indicative degree properties similar _ a, b are optional positive numbers , r and q are optional rational numbers let it be In that case :

1) **(ab)** $^{\mathbf{r}}$ **= a** $^{\mathbf{r}}$ **b** $^{\mathbf{r}}$ **(1').** Indeed , let r= $\frac{m}{n}$, n $\in$N , m $\in$Z . In that case :

$$((ab)^r)^n = \left((ab)^{\frac{m}{n}} \right)^n = \left(\sqrt[n]{(ab)^m} \right)^n = (ab)^m = a^m b^m = \left(\sqrt[n]{a^m} \right)^n \cdot \left(\sqrt[n]{b^m} \right)^n = \left(a^{\frac{m}{n}} \cdot b^{\frac{m}{n}} \right)^n = \left(a^r \cdot b^r \right)^n \text{ (1')}$$

In particular , $\left(\frac{a}{b} \right)^r = \frac{a^r}{b^r}$ (2')

2) a ^{r} • a ^{q} = a $^{r+q}$ where r= $\frac{k}{n}, q = \frac{m}{n}$. (3') Indeed ,

$$\left(a^{\frac{k}{n}} \cdot a^{\frac{m}{n}} \right)^n = \left(a^{\frac{k}{n}} \right)^n \cdot \left(a^{\frac{m}{n}} \right)^n = \left(\sqrt[n]{a^k} \right)^n \cdot \left(\sqrt[n]{a^m} \right)^n = = a^k \cdot a^m = a^{k+m} = \left(a^{\frac{k+m}{n}} \right)^n = \left(a^{\frac{k}{n} + \frac{m}{n}} \right)^n.$$

3) $\frac{a^r}{a^q} = a^{r-q}$ (4'). As in ((2'). is proved). 4) (a ^{r}) ^{q} = a ^{rq} , where $r = \frac{p}{k}, q = \frac{m}{n}$. (5') Indeed ,

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$\left(\left(a^{\frac{p}{k}}\right)^{\frac{m}{n}}\right)^{n\cdot k} = \left(\left(\left(a^{\frac{p}{k}}\right)^{\frac{m}{n}}\right)^{n}\right)^{k} = \left(\left(a^{\frac{p}{k}}\right)^{m}\right)^{k} = \left(a^{p}\right)^{m} = \left(a^{\frac{pm}{kn}}\right)^{kn}$. From this (5'). appropriate that known will be

Root _

Above arithmetic to the root definition given was _ a ≥0 at x= $\sqrt[n]{a}$ number x ^{n} =a of the equation the only one negative the solution that , and if a is ∈R and n is an odd natural number , then x ^{n} = a of the equation the only one that it has a solution below is proved .

x ^{n} =a of the equation (this where a ∈R, n ∈N) each how root of the number a ***n- level root*** is called

Theorem 1 . ***Har for any real number a ≥0 each always the equation x ^{n} =a satisfactory there is a unique real number x ≥0 .***

Theorem 2 a. ***If A is no natural number n- th power of a natural number if not , $\sqrt[n]{A}$ the number is irrational .***

Proof . Condition number of A on negative of numbers 0 ^{n} ,1 ^{n} ,2 ^{n} ,….., k ^{n} ,….. . n- levels in sequence does not occur $\sqrt[n]{A}$, so not an integer . It is not even a fraction . Indeed , $\sqrt[n]{A}=\frac{p}{q}$ Let it be let's say , where p and q are prime and p 1 ≠, q ≠0. Then A= $\frac{p^n}{q^n}$ p ^{n} and q ^{n} is a reciprocal radical, q ≠1

number of A from being irreducible fraction will be And this condition opposite. Therefore , $\sqrt[n]{A}$ the number only is irrational . Theorem proof done _

Theorem 3 . ***If $\frac{p}{q}$, q ≠1, is irreducible of the fraction photo and the denominator exactly nth degree if not , $\sqrt[n]{\frac{p}{q}}$ root irrational is a number .***

Proof . Conversely , the root assuming that it is a rational number let , i.e. $\sqrt[n]{\frac{p}{q}} = \frac{a}{b}$, B(a, b)=1. In that case $\frac{p}{q}=\frac{a^n}{b^n}$, B(a ^{n} ,b ^{n})= l and from which p= a ^{n} ,q = b ^{n} to be come comes out. But a must on p and q n- degree not _ So , $\sqrt[n]{\frac{p}{q}}$ is an irrational number. Proof done _

Theorem 4 a. ***Real numbers in the field odd level root only one valuable and his for this equality suitable for :***

$$\sqrt[2n+1]{-a} = -\sqrt[2n+1]{a}$$

I Proof. x $^{2n+1}$ = a, a 0, ≥equation (1). ∀a ∈for R the only one that it has a solution we show :

a) Let a ≥be 0.U without ∀x $^{2n+1}$ $^{<0}$ for the number x< 0 ≤a. So , the existence of (1) is from Theorem 1 visible , x= $\sqrt[2n+1]{-a} \geq 0$ root his the only one real is the root ;

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if a<0 , (1) in the form $(-x)^{2n+1}$ =-a writing get it is possible that -a>0 for , a) to the case according to the last equation and , therefore , equation (1) is also unique x= $\sqrt[2n+1]{-a}$ to the solution has _

$\forall a \in R$ for $x_1 = -\sqrt[2n+1]{-a}$ and $x_2 = \sqrt[2n+1]{-a}$ numbers (1) of roots will be. Above proven - to according to , $x_1 = x_2$. Theorem proof done _

From the theorem it seems that , $\sqrt[n]{a^n}$ = a is always greater than 1 of n in odd natural values , for arbitrary $\alpha \in R$ appropriate . If n = 2m (this where $m \in N$) , $\sqrt[2m]{a^{2m}} = \sqrt[2m]{|a|^{2m}} = |a|$ will be. So , if a ≥0 , $\sqrt[2m]{a^{2m}}$ = a is equality , when a < 0 while $\sqrt[2m]{a^{2m}}$ =-a equality appropriate .

Example 3. $\sqrt{(-7)^2} = \sqrt{|-7|^2} = |-7| = 7, ... \sqrt{(-7)^2} = \sqrt{49} = 7.$

If a ≤0, b ≤0 , then ab ≥0 and $\sqrt{ab} = \sqrt{|a||b|} = \sqrt{|a|}\sqrt{|b|}$ will be

Example 4. $\sqrt{(-3)(-12)} = \sqrt{|-3||-12|} = \sqrt{36} = 6$.

3. Arithmetic the roots form replacement _

Multiplication to the nth degree root multipliers are of n- degree of the roots to the product equal : $\sqrt[n]{a \cdot b \cdot ... \cdot c} = \sqrt[n]{a} \cdot \sqrt[n]{b} \cdot ... \cdot \sqrt[n]{c}$ **, (1)** this where a ≥0,b ≥0,...,c ≥0.

Indeed , $\sqrt[n]{a \cdot b \cdot ... \cdot c} = (a \cdot b \cdot ... \cdot c)^{\frac{1}{n}} = a^{\frac{1}{n}} \cdot b^{\frac{1}{n}} \cdot ... \cdot c^{\frac{1}{n}} = \sqrt[n]{a} \cdot \sqrt[n]{b} \cdot ... \cdot \sqrt[n]{c}$. (2)

In particular , $\sqrt[n]{a^n b} = \begin{cases} |a|\sqrt[n]{b}, agar. n - juft. bo'lsa, \\ a\sqrt[n]{b}, agar. n - toq. bo'lsa. \end{cases}$

Multiplier root hint under input : , a $\sqrt[n]{b} = \sqrt[n]{a^n b}$ (a > 0, b > 0). (3)

From the palace root output : $\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$, (a ≥0, b ≥0) . (4)

The root to the degree raise for root under expression that's it to the degree raise enough :

$(\sqrt[n]{a})^m = \sqrt[n]{a^m}$, (a ≥0). (5)

Indeed , $(\sqrt[n]{a})^m = \left(a^{\frac{1}{n}}\right)^m = a^{m \cdot \frac{1}{n}} = (a^m)^{\frac{1}{n}} = \sqrt[n]{a^m}$.

a is the n-th degree of the m-th degree of the number root to find for n- degree of a root to the m-th degree raise is enough , i.e. $\sqrt[n]{a^m} = (\sqrt[n]{a})^m$, (a>0). (6)

From the root release for root under expression unchanged are left , the roots indicators while is multiplied : $\sqrt[n]{\sqrt[m]{a}} = \sqrt[n \cdot m]{a}$ (a ≥0). (7)

Indeed , $\sqrt[n]{\sqrt[m]{a}} = \left((a)^{\frac{1}{m}}\right)^{\frac{1}{n}} = a^{\frac{1}{m} \cdot \frac{1}{n}} = a^{\frac{1}{n \cdot m}} = \sqrt[nm]{a}$.

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4. Irrational expressions simplification.

Numbers, letters and algebraic operations (adding , subtracting , multiplying, dividing , to the degree raise and root output) is compiled with expression ***algebraic expression*** is called

Root release practice attended expression that's it to the argument relatively ***irrational expression*** is called

For example, $3-\sqrt{5},\sqrt{5+\sqrt{a}},\sqrt{a^2-\sqrt{ab}}$ expressions irrational are expressions .

Irrational expressions on deeds arithmetic deeds laws and roots on action to the rules according to will be done .

Example 6 . Level root from underneath in release degree indicator root to the indicator is divided . Out division and residual suitable in order root from underneath came out and root under the rest don't count degree indicators gives , $\sqrt[5]{a^7b^9c^{-10}}=abc^{-2}\sqrt[5]{a^2b^4}$.

References:

1. Abdug'aniyeva Xumora Baxtiyor qizi, O'roqov Uchqun Yunusovich. Davlat maqsadli jamg'armalarining iqtisodiy-ijtimoiy ahamiyati va so'ngi yillardagi o'zgarishlar. Journal of new century innovations. Volume – 6_Issue-7_Iyun_2022
2. Best-Practice Guide for a Positive Business and Investment Climate.Organization for Security and Co-operation in Europe (OSCE). 2018.
3. Vaxabov A.V., Xajibakiev Sh.X., Muminov N.G. Xorijiy investitsiyalar. O'quv qo'llanma. – T.: «Moliya», 2010.
4. Schwab K. World Economic Forum: The Global Competitiveness Report. Geneva: World Economic Forum, 2013.
5. Sultonov Sh., Chinqulov Q., G'ofurova U., Safarova N. Biznes moliyasi. O'quv qo'llanma. – T.: «Iqtisod-moliya», 2019.
6. Н.Х.Хайдаров. Роль иностранных инвестиций в финансовом оздоровлении Узбекистана. Финансы и кредит, 2001
7. Nizamiddin Khaydarov. Agricultural Development in Uzbekistan: Agricultural Reforms versus Transboundary Water Issues. Developing Country Studies www. iiste. org. ISSN. 2015

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