Radical Expressions II

SUMMARY KEYWORDS

square root, squared, rewrite, exponent, numerator, expression, equal, answer, negative, bracket, equation, cubed, left, divided, power, left hand side, work, numbers, square, denominator

SPEAKERS

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This is a great question, we've been given a radical expression. And we're being asked to rationalize the denominator, basically remove all the square root symbols from the denominator, and then simplify it as much as possible. Now, this is not a function or an equation, there's no right hand side left hand side. So we're left just with what we have to try and follow these instructions. I'm going to use the difference of squares. And notice I've got a minus here, which means that if I multiply, explain the numerator in a moment, by multiply the denominator by the same expression, but with a plus, I'm going to be able to get rid of the square roots. And I'll show you why. And if you remember the difference of squares, you already know why, let's try this two times the square root of three. Well, I'll just write it like that with a square, there's two of them. And we'll do plus two square root of three times three. I'll just leave it like that, then we've got negative three, times two times the square root of three. And finally, we've got minus three, square three times three. Notice that the plus and the negative are going to sum to zero. So we're going to be left with now I have completely forgotten the numerator. So let me rewrite this out, we've got negative four times this thing right here. Right, as long as I multiply the numerator and denominator by the same value, I don't change the expression. And that's divided by this thing. Now I'm going to work through the exponents. So all right, the numerator as is, and I've got the square. So two squared is four, the square root of three squared is just three. And that's going to be minus nine. Now I work for the numerator as well. So I'm going to have negative eight times the square root of three minus 12. And that whole thing is going to be divided by 12 minus nine and over three, and I look at that the numerator, I guess, maybe I should not have brought the four in the brackets. So I'll take I can factor out a four, we're gonna have negative four, square root of three minus three, that whole thing is going to be divided by three. And I just realized that I made a little mistake here. I forgot to. I should have had a two in front of this and a four here, like so. And I'll just redraw that thusly. Now when it comes to ALEKS, ALEKS doesn't like these brackets. So this is the answer that ALEKS would like. Let's look at this next question, which is asking us to simplify a higher radical expression. So again, we've got no left hand side right hand side, there's no equality. It's not a function. We just have to work with what we've been given. So to get started, I well find the hardest part with these questions is what to do with numbers with numbers like 48. So why don't I break 48 up into the smallest factors possible. So I'll rewrite the cube root four, like so. And I know that two divided by 24, or excuse me, 48 divided by two is 24. So that would get me one, two. And then with 24, I could have six times four. And then maybe I'll just take a little break, I don't want to do too much in my head. Because if I try to do too much in my head, I'm most more most likely or more likely to make a silly mistake. Now let's keep going. Because we can break this up even further. I've got the two sixes, two times three, and four is two

times two. So we've got s 19, here, and t 12. Now I've got a four up here, and I've got 1234 fours, excuse me, four twos. So I can sort of bring out those fours, or maybe I'll rewrite it like this as an intermediate step. I'm going to use our exponent rules to break up this fourth order root. And remember, the rule is something like well, if I've got x to the power of a, multiply by y to the power of B, and I've got this whole thing raised to say the power of C, that's equal to x A C, times why BC. And so that's the exponent rule. Or whatever one of them. Now looking over here, we got four squared, and I want to take the fourth root of that thing. So we're just going to be left with two on the outside. You know, it's kind of like having four for this thing to the power of one over four. And so we get four times one quarter, which is equal to one. Oh, I forgot that this three. So we should have a three in here, I'll add it to the end. And I've got s 91, I can just rewrite it like that and exponent form if I want, and I've got t to the 12 or four, and I still got the square root of three. Now rewriting this, so I've got to and outside the bracket, or maybe I'll just write with the whole number exponent, I'm going to write as to the power of four. Or maybe if to make it a little more clear for you, I'll write it as 16 over four. And you can see 12 divided by four, well, that's obviously to the power of three. Now, I've still got as to the power of three over four remaining, so I can put it back into the cube root like so. And then rewriting this kind of ugly thing I've got to ask to the power of four t to the power of three times the fourth root of three times s cubed. So here we are on ALEKS. The question is asking us to put the following expression in simplified radical form. So we're allowed to keep a square root, we just need to simplify it. Now I'll put in our answer. So we had two times s to the power of four times t to the power of three. And here, I'm going to use this expression here, the one that's highlighted in blue. And if I click on that, it's going to let me do an nth order root. So I've got a four there for the fourth root. And then I hit the right arrow key. Now I'm inside the bracket three times as to the power of three or s cubed. Now we're on the outside and I'll click the check button. And we had the we have the right answer. We're getting into an expression where we've got one radical subtracted from another radical. We have no equal sign here. We have no left hand side right hand side, it's not a function. It's not an equation. It's just an expression. And so we have to simply So as much as possible, why don't we start by doing what we did last time. And let's start with the numbers. So we've got y to the square root of 50. Well, I know that I could rewrite 50, like so. And I'll just leave the x cubed in there, minus nine x, and we've got the square root of y, I can't do anything with two. So I'll just rewrite the right hand term. Now going back to the next slide, we've got y, while y is just going to sit out there for now, that x cubed, I can do something with that I could bring out an x squared. And if I bring out the x squared, and take the square, I should say if I take the square root of the x squared, I'm just going to have x. And now I've got o and I now I can take out, I can take the square root of 25. So I've got five like that. And what's left in here is two X. Over here, we've got nine x, I can take the Y out. So now we've got the Y there. And what because of y squared, we just becomes the square root of that is just y. And we've got two x in there. And that's kind of handy. Because now I've got a square root of two x on both sides of the equation. So why don't I factor out the square root of two x. And I'm going to be left with five x y minus nine x y. And now I can factor out the x y. So we've got x y, square root of two x times five minus nine. And that gives us negative four, xy square root of two x, which looks like it could very well be the answer. Why don't we put it in ALEKS? And see if it is the answer. Here's ALEKS. I'm putting in the number or I'm putting in our answer negative for x, y. And here's the square root symbol that I want to use. And we're to x down there and click on the check button. And we got the right answer. We've got a square root of y here and we've got a y to the power of one. So I suspect two solutions exist. Just like if I have y squared is equal to four. That's like y is equal to plus minus two, right? It could be minus two, or could be plus two. So

let's go ahead, I've got the square root on the entire left hand side. So one thing I could do, and I'll do this, so just again, to help you look at it, I could rewrite this whole thing, like so. Now, if I want to collect sort of like terms, I don't really know what to do with the square root of four y minus seven. So one thing I can do to try and make this easier to work with and get to the answer is I can square both sides of the equation, I can square both sides of the equation. And if I do that exponent rule says the one half is going to be multiplied by the square the two. And then I take the square this whole thing, remember, remember common student error, why minus three squared is not equal to y squared minus three squared. Right in general, that's not true. And specifically here, it's not true either. Now what have we got, we've got on the left hand side, we just have four y minus seven, that's nice. I can use I can split up the terms I can work with the four y and the negative seven separately. And on the right hand side, I've got this y minus three, that whole thing's squared. Want to open up the bracket what I call opening up the bracket? And if I do that, I'm going to have y squared. And I know I'll have six. Why? Because this is a special kind of equation that I've memorized the answer to most people memorize the answer two, plus nine, right three times three, you can work it out if you want to the FOIL method, as ALEKS explains to you, but I know what the answer is going to be that. Now, what do I want to do, I've got a quadratic, I've got a quadratic. So I want to set this thing equal to zero. And then I can solve it by factoring. Or I can solve it using the quadratic formula. And I want to, so I want to collect like terms here and set the whole expression equal to zero. If I do that, I'm going to get y squared minus 10 y plus 16 is equal to zero. Now, how can I have two numbers that sum to negative 10? And that multiply to each other is equal to 16? Well, if I've got y minus eight, and y minus two, I'm going to be able to factor that quadratic expression. And I can see here that if y is equal to eight, or y is equal to two, I should say the equation is true. Wait a second. Are we sure that this equation is solved when y is equal to eight, or y is equal to two? Well, let's give it a try if y is equal to two, and we get four times two minus seven is equal to two minus three. And we end up with one is equal to negative one, which is a contradiction. Y equals two is not a solution. How about if y is equal to eight? If y is equal to eight, eight times four minus seven, the square root of that whole thing is equal to eight minus three. We've got 32 minus seven is equal to five, which is the square root of 25 is equal to five and five equals five. So why is equal to two y? Well, y equals two is not a solution. We already said that y is equal to eight is a solution. So there's only one solution here, not two solutions.