AM: Simplify expressions with rational exponents

Identify the simplified form of the expression:

$x^{1/2} = \sqrt{x}$

1. $9^{-3/2}$ [A] $\frac{1}{27}$ [B] -27 [C] 27 [D] $\frac{1}{3}$

$9^{-3/2} = \frac{1}{9^{3/2}} = \frac{1}{(9^{1/2})^3} = \frac{1}{3^3} = \frac{1}{27}$

LO: First, we can rewrite $9^{-3/2}$ as $\frac{1}{9^{3/2}}$ because of the negative exponent property. Next we can rewrite $1/9^{3/2}$ as $1/(9^{1/2})^3$ because of the power property. We can evaluate $1/(9^{1/2})^3$ to get an answer of $1/27$.

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2. $\left[\dfrac{x^{11/4}y^{-1/4}}{x^{1/3}y^{2/3}}\right]^{12}$

[A] $\dfrac{x^{32}}{y^{9}}$ [B] $\dfrac{x^{37}}{y^{11}}$ [C] $\dfrac{x^{29}}{y^{11}}$ [D] $\dfrac{x^{29}}{y^{7}}$

$\dfrac{x^{11/4\cdot 12}\,y^{-1/4\cdot 12}}{x^{1/3\cdot 12}\,y^{2/3\cdot 12}}$ Power rule

quotient rule

$\dfrac{x^{33}\,y^{-3}}{x^{4}\,y^{8}}$

$x^{29}y^{-11}$ negative exp. rule $\dfrac{x^{29}}{y^{11}}$

HINT: Parenthesis first? Correct but slow.

Use a property of exponents that will exploit that the denominators are factors of 12?

How will this make the problem easier?

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3. Simplify by writing the expression as a single quotient in which only positive exponents appear.

$$\frac{(49-x^2)^{1/2}+4x^2(49-x^2)^{-1/2}}{49-x^2}$$

base: $49-x^2=w$

[A] $\frac{49+3x^2}{(49-x^2)^{3/2}}$ [B] $\frac{49+4x^2}{(49-x^2)^{3/2}}$ [C] $\frac{49+2x^2}{(49-x^2)^{3/2}}$ [D] none of these

Split into 2 fractions

$$\frac{(49-x^2)^{1/2}}{(49-x^2)^1}+\frac{4x^2(49-x^2)^{-1/2}}{(49-x^2)^1}$$

Substitute $w=49-x^2$

$$\frac{w^{1/2}}{w^1}+\frac{4x^2\,w^{-1/2}}{w^1}$$

quotient rule

$$w^{-1/2}+4x^2\,w^{-3/2}$$

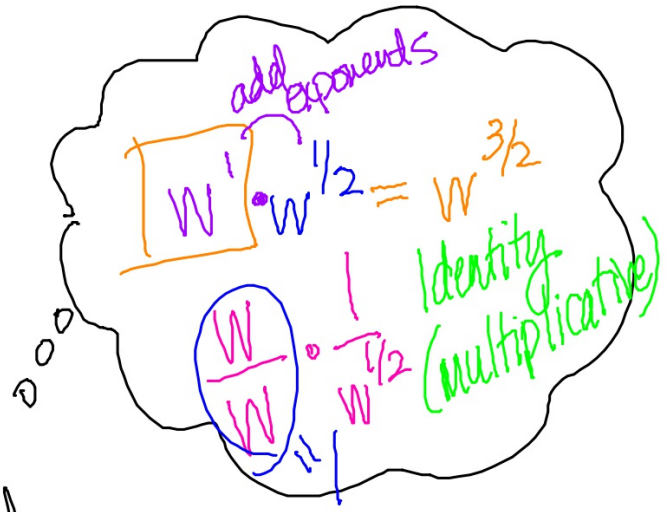
negative exponent rule

$$\frac{1}{w^{1/2}}+\frac{4x^2}{w^{3/2}}$$

$$\frac{W}{W}\cdot\frac{1}{W^{1/2}}+\frac{4x^2}{W^{3/2}}$$

GOAL: RECOMBINE THE FRACTIONS

MUST HAVE COMMON DENOMINATOR



$$\frac{W}{W^{3/2}}+\frac{4x^2}{W^{3/2}}$$

Recombined

$$\frac{W+4x^2}{W^{3/2}}$$

put back $W=49-x^2$ (resubstitute)

$$\Rightarrow \frac{(49-x^2)+4x^2}{(49-x^2)^{3/2}}=$$

Combine like terms

$$\frac{49+3x^2}{(49-x^2)^{3/2}}$$

FINAL ANSWER

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4. Simplify: $\left(\frac{b^{16}}{c^{12}}\right)^{3/4}$

$\frac{b^{12}}{c^{9}}$

AM: Factor expressions w/ rational exponents

2. $4x^{1/6} + 6x^{25/6} - 2x^{7/6}$

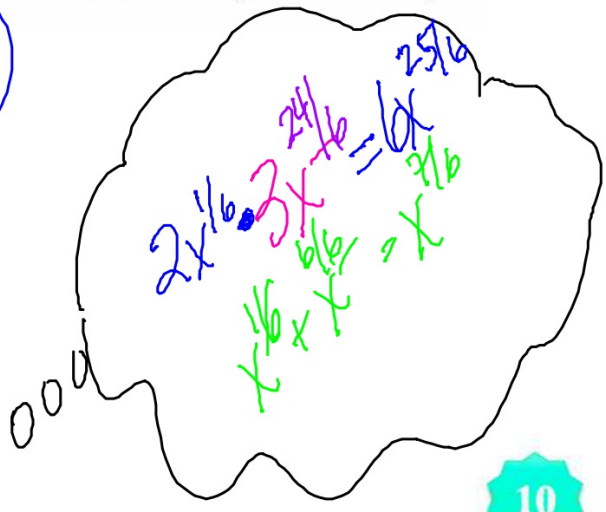
[A] $2x^{-1/6}\left(2 - 3x^{4} + x^{-4/3}\right)$

[B] $2x^{1/6}\left(2 + 3x^{4} - x\right)$

[C] $2x^{1/6}\left(2 - 3x^{4} + x\right)$

[D] $2x^{-1/6}\left(2 + 3x^{-13/3} - x\right)$

$2x^{1/6}\left(2 + 3x^{4} - 1x^{1}\right)$



AM: Factor expressions w/ rational exponents

Factor:

3. $3x^{-1/6} - 15x^{17/6}$

$3x^{-1/6}(1 - 5x^{3})$

$17/6$

$18/6 = x$

$-1/6 \cdot x$

x

4. $16x^{-1/6} - 8x^{5/6} + 4x^{29/6}$