

R2 Day 3 - Mixed Practice

(1-13) Simplify using only positive exponents. Assume all variables are positive.

$$1. v^{\frac{1}{5}} \cdot v^{\frac{6}{5}}$$

$$= v^{5/5}$$

$$= v$$

$$2. (x^{-3})^{\frac{1}{6}}$$

$$= x^{-3/6}$$

$$= x^{-1/2}$$

$$3. \left(\frac{w^4}{9x^{-2}} \right)^{\frac{1}{2} - 1}$$

$$= \left(\frac{w^4 x^2}{9} \right)^{1/2}$$

$$= \left(\frac{w^2 x}{3} \right)^{-1} = \frac{3}{w^2 x}$$

$$4. (-27)^{\frac{4}{3}}$$

$$= \left((-27)^{1/3} \right)^4$$

$$= -\frac{1}{81}$$

$$5. \frac{x^2}{x^{\frac{1}{5}}}$$

$$= x^{2 - \frac{1}{5}}$$

$$= x^{\frac{10}{5} - \frac{1}{5}}$$

$$= x^{\frac{9}{5}}$$

$$= x \cdot x^{4/5}$$

$$6. (343)^{\frac{1}{3}}$$

$$= \frac{1}{7}$$

$$7. \left(\frac{1}{125} \right)^{\frac{2}{3}}$$

$$= \left(\frac{1}{5} \right)^2$$

$$= \frac{1}{25}$$

$$8. (-625)^{\frac{1}{4}}$$

Not defined

$$9. \frac{1}{2\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$$

$$= \frac{\sqrt{5}}{10}$$

$$10. \frac{12y^2}{\sqrt{6y}} \cdot \frac{\sqrt{6y}}{\sqrt{6y}}$$

$$= \frac{12y^2 \sqrt{6y}}{\sqrt{6y}}$$

$$= 2y \sqrt{6y}$$

$$11. \frac{\sqrt[8]{16}}{\sqrt[5]{4}}$$

$$= \frac{(2^4)^{1/8}}{(2^2)^{1/5}} = \frac{2^{1/2}}{2^{2/5}} = 2^{5/10 - 4/10}$$

$$= 2^{1/10}$$

$$12. \frac{1}{\sqrt[3]{7}} = \frac{1}{7^{1/3}} \cdot \frac{7^{2/3}}{7^{2/3}}$$

$$= \frac{7^{2/3}}{7}$$

$$13. \frac{3}{\sqrt[3]{54}} = \frac{3}{\sqrt[3]{27 \cdot 2}} = \frac{3}{3\sqrt[3]{2}} \cdot \frac{2^{2/3}}{2^{2/3}}$$

$$= \frac{2^{2/3}}{2}$$

$$14. \frac{3\sqrt{2}-2\sqrt{3}}{3\sqrt{3}-2\sqrt{2}} \cdot \frac{3\sqrt{3}+2\sqrt{2}}{3\sqrt{3}+2\sqrt{2}}$$

$$= \frac{9\sqrt{6}+6\sqrt{4}-6\sqrt{9}-4\sqrt{6}}{9\sqrt{9}+6\sqrt{6}-6\sqrt{6}-4\sqrt{4}}$$

$$= \frac{-6+5\sqrt{6}}{19}$$

$$15. \frac{3\sqrt{y}}{2\sqrt{y}-3} \cdot \frac{2\sqrt{y}+3}{2\sqrt{y}+3}$$

$$= \frac{6\sqrt{y^2}+9\sqrt{y}}{4\sqrt{y^2}+6\sqrt{y}-6\sqrt{y}-9}$$

$$= \frac{6y+9\sqrt{y}}{4y-9}$$

$$16. \left(\frac{8a^{-4}b^3}{27a^2b^{-3}} \right)^{\frac{1}{3}}$$

$$= \left(\frac{8b^6}{27a^6} \right)^{\frac{1}{3}}$$

$$= \frac{2b^2}{3a^2}$$

$$17. \frac{3mn^2p^{-6}}{4n^3n} \cdot \left(\frac{9m^{-2}p^2}{16mn^4p^5} \right)^{-1}$$

$$= \frac{3n}{4pb} \cdot \left(\frac{9}{16m^3n^4p^3} \right)^{-1}$$

$$= \frac{3n}{4pb} \cdot \frac{16m^3n^4p^3}{9}$$

$$= \frac{4m^3n^4}{3p^3}$$

18. A challenge. Simplify completely, assuming all variables are positive

$$\left(\frac{\left(\frac{zx^2y^{-4}}{xy^5x^{-2}} \right)^{-2} \cdot x^{-6}y^7}{4xyz^{-3}x^{-6}} \right)^{-3}$$

$$\left(\frac{z^2x^2x^2}{xy^5y^4} \right)^{-2} = \left(\frac{z^2x^3}{y^9} \right)^{-2} = \left(\frac{z^2x}{y^{18}} \right)^{-2} = \frac{y^{18}}{z^2x^2}$$

$$\frac{4xx^6y}{z^3} = \frac{4x^7y}{z^3}$$

$$\frac{-2x^6}{y^7}$$

$$\left(\frac{\frac{y^{18}}{z^2x^2} \cdot \frac{-2x^6}{y^7}}{\frac{4x^7y}{z^3}} \right)^{-3} = \left(\frac{-2y^{11}}{z^2} \cdot \frac{z^3}{4x^7y} \right)^{-3}$$

$$= \left(\frac{-1y^{10}z}{2x^7} \right)^{-3}$$

$$= \left(\frac{-1y^{30}z^3}{8x^{21}} \right)^{-1} = \frac{8x^{21}}{y^{30}z^3}$$

19. Find x and y when $b^x b^y = b^8$ and $b^{4x} b^{-2y} = b^2$.

$$\begin{aligned} (x+y=8) \cdot -2 \\ 4x-2y=2 \\ -2x-2y=-16 \\ \hline 2x=-14 \\ x=-7 \\ y=15 \end{aligned}$$

20. For what values of x is $x = x^{\frac{1}{3}}$?

$$\begin{aligned} 0 &= 0^{1/3} \\ 1 &= 1^{1/3} \\ -1 &= (-1)^{1/3} \end{aligned}$$