

SOLUTIONS \Rightarrow Solving Exp. Eq/Rat. Exp/Exp. Law

1. $(u^{-2}v^3 \cdot u^{-1}v^{-4})^4$ 2. $(2x^{-2} \cdot (y^2)^2)^0$

$= (u^{-3}v^{-1})^4$

$= u^{-12}v^{-4}$

$= \frac{1}{u^{12}v^4}$

$= (2x^{-2}y^4)^0$

$= 1$

3. $(2uv^{-2} \cdot 2vu^2)^{-2}$

$= (4u^3v^{-1})^{-2}$

$= \frac{1}{(4u^3v^{-1})^2}$

$= \frac{1}{16u^6v^{-2}}$

$= \frac{v^2}{16u^6}$

4. $(x^4)^3 \cdot 2x^{-1}$

$= x^{12} \cdot 2x^{-1}$

$= 2x^{11}$

$$5. \frac{(2x^2)^{-1}}{2yx^{-3} \cdot 2y^3}$$

$$= \frac{(2)^{-1} x^{-2}}{4x^{-3} y^4}$$

$$= \frac{1x^3}{(2)(4)x^2 y^4}$$

$$= \frac{1x^3}{8x^2 y^4}$$

$$= \frac{1x}{8y^4}$$

$$= \frac{x}{8y^4}$$

$$6. \frac{2u^{-2}v^4 \cdot 2u^3v^4}{(uv^4)^{-2}}$$

$$= \frac{4u^1v^8}{u^{-2}v^{-8}}$$

$$= 4u^1u^2v^8v^8$$

$$= 4u^3v^{16}$$

$$7. \frac{2b^4}{a^4b^{-4} \cdot (a^2b^{-2})^{-4}}$$

$$= \frac{2b^4}{a^4b^{-4} \cdot a^{-8}b^8}$$

$$= \frac{2b^4}{a^{-4}b^4}$$

$$= \frac{2a^4b^4}{b^4}$$

$$= 2a^4$$

$$8. \left(\frac{2xy \cdot 2xy^0}{2x^{-4}y^0} \right)^{-1}$$

$$= \left(\frac{4x^2y^1}{2x^{-4}y^0} \right)^{-1}$$

$$= \left(2x^2x^4y^1 \right)^{-1}$$

$$= \frac{1}{2x^6y}$$

$$\begin{aligned}
 9. & \left(\frac{xy^{-2}}{x^{-2}y^{3/2} \cdot y^0} \right)^{\frac{1}{3}} & 10. & \left(\frac{(ab^{\frac{2}{3}})^0}{a^0b^{\frac{1}{2}} \cdot a^2b^{-\frac{1}{2}}} \right)^{\frac{7}{4}} \\
 & = \left(\frac{xy^{-2}}{x^{-2}y^{3/2}} \right)^{\frac{1}{3}} & & = \left(\frac{1}{a^2b^0} \right)^{7/4} \\
 & = \left(\frac{x \cdot x^2}{y^2 y^{3/2}} \right)^{\frac{1}{3}} & & = \frac{1}{a^{14/4} b^0} \\
 & = \left(\frac{x^3}{y^{7/2}} \right)^{\frac{1}{3}} & & = \frac{1}{a^{14/4}} \\
 & = \frac{x^{3/3}}{y^{7/6}} & & = \frac{1}{a^{7/2}} \\
 & = \frac{x}{y^{7/6}} \\
 & = \frac{x}{y^{7/6}}
 \end{aligned}$$

$$11. 4^{-2x-2} \cdot 64 = \frac{1}{4}$$

$$(2^2)^{-2x-2} \cdot (2^6) = \frac{1}{4}$$

$$2^{-4x-4} \cdot 2^6 = \frac{2^2}{2^2}$$

$$2^{-4x-4+6} = 2^{-2}$$

$$2^{-4x+2} = 2^{-2}$$

$$-4x+2 = -2$$

$$-4x = -2-2$$

$$\frac{-4x}{-4} = \frac{-4}{-4}$$

$$x = 1$$

$$12. 5^{3-3n} = 25$$

$$5^{3-3n} = 5^2$$

$$3-3n = 2$$

$$-3n = 2-3$$

$$\frac{-3n}{-3} = \frac{-1}{-3}$$

$$n = \frac{1}{3}$$

$$13. 5^{3a+1} = 5^{3-2a}$$

$$3a+1 = 3-2a$$

$$3a+2a = 3-1$$

$$\frac{5a}{5} = \frac{2}{5}$$

$$a = \frac{2}{5}$$

$$14. 6^{2k-1} = 216$$

$$6^{2k-1} = 6^3$$

$$2k-1 = 3$$

$$2k = 3+1$$

$$\frac{2k}{2} = \frac{4}{2}$$

$$k = 2$$

$$15. 25^{2-2p} \cdot \frac{1}{5} = 5^4$$

$$(5^2)^{2-2p} \cdot 5^{-1} = 5^4$$

$$5^{4-4p} \cdot 5^{-1} = 5^4$$

$$5^{4-4p-1} = 5^4$$

$$5^{-4p+3} = 5^4$$

$$-4p+3 = 4$$

$$-4p = 4-3$$

$$\frac{-4p}{-4} = \frac{1}{-4}$$

$$p = -\frac{1}{4}$$

$$16. \left(\frac{1}{625}\right)^{3n-3} = 25^{2n}$$

$$\left(\frac{1}{5^4}\right)^{3n-3} = (5^2)^{2n}$$

$$(5^{-4})^{3n-3} = 5^{4n}$$

$$5^{-12n+12} = 5^{4n}$$

$$-12n+12 = 4n$$

$$12 = 4n+12n$$

$$12 = 16n$$

$$\frac{12}{16} = \frac{16n}{16}$$

$$\frac{3}{4} = n$$

$$\frac{3}{4} = n$$

$$17. 2^{-3m} = 2^{2-m}$$

$$\begin{aligned} -3m &= 2-m \\ -3m+m &= 2 \\ \frac{-2m}{-2} &= \frac{2}{-2} \\ m &= -1 \end{aligned}$$

$$18. 9^{3x-2} = 27^{2x}$$

$$\begin{aligned} (3^2)^{3x-2} &= (3^3)^{2x} \\ 3^{6x-4} &= 3^{6x} \\ 6x-4 &= 6x \\ -4 &= 6x-6x \\ -4 &\neq 0 \end{aligned}$$

NO SOLUTION!

$$19. 64^{3x-2} \cdot 16^{-2x} = 4^2$$

$$\begin{aligned} (2^6)^{3x-2} \cdot (2^4)^{-2x} &= (2^2)^2 \\ 2^{18x-12} \cdot 2^{-8x} &= 2^4 \end{aligned}$$

$$\begin{aligned} 2^{18x-12-8x} &= 2^4 \\ 2^{10x-12} &= 2^4 \end{aligned}$$

$$\begin{aligned} 10x-12 &= 4 \\ 10x &= 4+12 \end{aligned}$$

$$\begin{aligned} \frac{10x}{10} &= \frac{16}{10} \\ x &= \frac{8}{5} \end{aligned}$$

$$20. \left(\frac{1}{5}\right)^{2k} \cdot 625^{3k} = 25$$

$$\begin{aligned} (5^{-1})^{2k} \cdot (5^4)^{3k} &= 5^2 \\ 5^{-2k} \cdot 5^{12k} &= 5^2 \\ 5^{-2k+12k} &= 5^2 \\ 5^{10k} &= 5^2 \\ \frac{10k}{10} &= \frac{2}{10} \\ k &= \frac{1}{5} \end{aligned}$$

$$21. \frac{64^{-2p}}{16^{3-3p}} = 16$$

$$\frac{(2^6)^{-2p}}{(2^4)^{3-3p}} = 2^4$$

$$\frac{2^{-12p}}{2^{12-12p}} = 2^4$$

$$2^{12-12p} = 2^4$$

$$2^{-12p - (12-12p)} = 2^4$$

$$2^{-12p - 12 + 12p} = 2^4$$

$$2^{-12} \neq 2^4$$

NO SOLUTION!

$$22. \frac{625^{-2x-1}}{625^{-3x}} = 125$$

$$\frac{(5^4)^{-2x-1}}{(5^4)^{-3x}} = (5^3)$$

$$\frac{5^{-8x-4}}{5^{-12x}} = 5^3$$

$$5^{-8x-4 - (-12x)} = 5^3$$

$$5^{-8x-4+12x} = 5^3$$

$$5^{4x-4} = 5^3$$

$$4x-4 = 3$$

$$\frac{4x}{4} = \frac{7}{4} \quad x = \frac{7}{4}$$

$$23. \left(\frac{1}{8}\right)^{3n+1} \cdot 8^2 = \left(\frac{1}{64}\right)^{2n-3}$$

$$\left(\frac{1}{2^3}\right)^{3n+1} \cdot (2^3)^2 = \left(\frac{1}{2^6}\right)^{2n-3}$$

$$(2^{-3})^{3n+1} \cdot 2^6 = (2^{-6})^{2n-3}$$

$$2^{-9n-3} \cdot 2^6 = 2^{-12n+18}$$

$$2^{-9n-3+6} = 2^{-12n+18}$$

$$2^{-9n+3} = 2^{-12n+18}$$

$$-9n+3 = -12n+18$$

$$-9n+12n = 18-3$$

$$\frac{3n}{3} = \frac{15}{3}$$

$$n=5$$

$$24. \left(\frac{1}{6}\right)^{-n} \cdot \left(\frac{1}{36}\right)^{2n+3} = 1$$

$$(6^{-1})^{-n} \cdot \left(\frac{1}{6^2}\right)^{2n+3} = 6^0$$

$$6^n \cdot (6^{-2})^{2n+3} = 6^0$$

$$6^n \cdot 6^{-4n-6} = 6^0$$

$$6^{n+(-4n-6)} = 6^0$$

$$6^{-3n-6} = 6^0$$

$$-3n-6=0$$

$$\frac{-3n}{-3} = \frac{6}{-3}$$

$$n=-2$$