$3y^{-\frac{4}{3}} \cdot 2\sqrt[3]{y}$

$3y^{-\frac{4}{3}} \cdot 2y^{\frac{1}{3}}$

$\boxed{6y^{-1}}$

$\sqrt[4]{\frac{x^2}{x^{\frac{2}{3}}}} = \left(\frac{x^2}{x^{\frac{2}{3}}}\right)^{\frac{1}{4}}$

$\left(x^2 \cdot x^{-\frac{2}{3}}\right)^{\frac{1}{4}} = \left(x^{\frac{4}{3}}\right)^{\frac{1}{4}} = \boxed{x^{\frac{1}{3}}}$

$\frac{10\sqrt[3]{z}}{2z^2} = \frac{10z^{\frac{1}{3}}}{2z^2} = 5z^{\frac{1}{3}-2} = \boxed{5z^{-\frac{5}{3}}}$

$\sqrt{x^{\frac{3}{4}}x^{-1}}$

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

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

$\boxed{x^{-\frac{1}{8}}}$

$\left(4\sqrt[4]{y^5}\right)^{\frac{1}{2}}$

$\left(4y^{\frac{5}{4}}\right)^{\frac{1}{2}}$

$\boxed{2y^{\frac{5}{8}}}$

$2\sqrt{x} \cdot 4x^{-\frac{5}{2}}$

$2x^{\frac{1}{2}} \cdot 4x^{-\frac{5}{2}}$

$8x^{\frac{1}{2}-\frac{5}{2}}$

$\boxed{8x^{-2}}$

$$\sqrt[3]{\frac{y^2}{y^{\frac{4}{5}}}}$$

$$\left(\frac{y^2}{y^{\frac{4}{5}}}\right)^{\frac{1}{3}}$$

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

$$\left(y^{\frac{6}{5}}\right)^{\frac{1}{3}}$$

$$\boxed{y^{\frac{2}{5}}}$$

$$\left(\sqrt[4]{x}\right)^{-1} = \left(x^{\frac{1}{4}}\right)^{-1} = x^{-\frac{1}{4}}$$

$$-\sqrt[4]{x} = -x^{\frac{1}{4}}$$

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

$$3\sqrt[4]{z} \cdot 3z^{\frac{3}{4}}$$

$$3z^{\frac{1}{4}} \cdot 3z^{\frac{3}{4}}$$

$$9z^1 = \boxed{9z}$$

$$\left(\sqrt[7]{c}\right)^5 = \left(c^{\frac{1}{7}}\right)^5 = \boxed{c^{\frac{5}{7}}}$$

$$\frac{\sqrt[2]{b}}{\sqrt[3]{b}} = \frac{b^{\frac{1}{2}}}{b^{\frac{1}{3}}}$$

$$= b^{\frac{1}{6}}$$

Evaluating fractional exponents

$64^{\frac{1}{3}} = \sqrt[3]{64} = 4$

$4^3 = 64$

$64^{\frac{2}{3}} = \left(64^{\frac{1}{3}}\right)^2$

$= \left(\sqrt[3]{64}\right)^2$

$= (4)^2 = 16$

$(2^3)^4 = 2^{3 \cdot 4} = 2^{12} = (2^4)^3$

$\left(\frac{8}{27}\right)^{-\frac{2}{3}} = \left(\frac{27}{8}\right)^{\frac{2}{3}} = \frac{27^{2/3}}{8^{2/3}} = \frac{\left(27^{1/3}\right)^2}{\left(8^{1/3}\right)^2} = \frac{\left(\sqrt[3]{27}\right)^2}{\left(\sqrt[3]{8}\right)^2}$

$= \frac{(3)^2}{(2)^2}$

$= \frac{9}{4}$

negative exponent means fraction can be flipped to get positive exponent

exponent can be applied to both the numerator and denominator separately

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

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

$9^{1/2} = 3$

$9^{-1/2} = \frac{1}{9^{1/2}} = \frac{1}{\sqrt{9}} = \boxed{\frac{1}{3}}$

$$\left(\frac{25}{9}\right)^{\frac{1}{2}} = \frac{\sqrt{25}}{\sqrt{9}} = \boxed{\frac{5}{3}}$$

$$\left(\frac{5}{3}\right)^2 = \frac{5}{3} \cdot \frac{5}{3} = \boxed{\frac{25}{9}}$$

$$\left(\frac{81}{256}\right)^{-\frac{1}{4}} = \left(\frac{256}{81}\right)^{\frac{1}{4}} = \frac{\sqrt[4]{256}}{\sqrt[4]{81}} = \boxed{\frac{4}{3}}$$

$4^4 = 4 \cdot 4 \cdot 4 \cdot 4 = 256^{\frac{1}{4}}$

$16 / 64 / 256$

$3^4 = 3 \cdot 3 \cdot 3 \cdot 3 = 81$

$9 / 27 / 81$

$3 = 81^{\frac{1}{4}}$

$$\frac{256^{4/7}}{2^{4/7}} = \left(\frac{256}{2}\right)^{\frac{4}{7}}$$

$$(128)^{4/7} = (128^{\frac{1}{7}})^4 = (2)^4$$

$$= \boxed{16}$$

$$\frac{x^a}{y^a} = \left(\frac{x}{y}\right)^a$$

$2^7 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 128$

$4 / 8 / 16 / 32 / 64 / 128$

$$128^{\frac{1}{7}} = 2$$

$$\sqrt[7]{128} = 2$$

$$6^{\frac{1}{2}} \cdot \left(\sqrt[5]{6}\right)^3$$

$$6^{1/2} \cdot \left(6^{\frac{1}{5}}\right)^3$$

$$6^{1/2} \cdot 6^{\frac{1}{5} \cdot 3}$$

$$6^{1/2} \cdot 6^{3/5}$$

$$\boxed{6^{11/10}}$$

$$\frac{125^{-11/12}}{125^{-1/4}} = 125^{-2/3}$$

$$= \frac{1}{125^{2/3}}$$

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

$$\frac{1}{\left(\sqrt[3]{125}\right)^2} = \frac{1}{(5)^2}$$

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

$$\frac{2^{-\frac{4}{3}}}{54^{-\frac{4}{3}}} = \left(\frac{2}{54}\right)^{-\frac{4}{3}}$$

$$= \left(\frac{54}{2}\right)^{\frac{4}{3}} = (27)^{4/3}$$

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

$$= \left(\sqrt[3]{27}\right)^4$$

$$= (3)^4 = \boxed{81}$$

$$\frac{\sqrt[3]{250}}{\sqrt[3]{2}} = \sqrt[3]{\frac{250}{2}}$$

$$= \sqrt[3]{125}$$

$$= \boxed{5}$$

$$\frac{\sqrt{98}}{2^{\frac{1}{2}}} = \frac{98^{\frac{1}{2}}}{2^{\frac{1}{2}}} = \left(\frac{98}{2}\right)^{\frac{1}{2}} = (49)^{\frac{1}{2}} = \sqrt{49} = \boxed{7}$$

$$\frac{64^{7/10}}{64^{1/5}} = 64^{\frac{1}{2}} = \sqrt{64} = \boxed{8}$$

$$\sqrt[5]{-16} \cdot \sqrt[5]{2}$$

$$\sqrt[5]{-16 \cdot 2} = \sqrt[5]{-32} = \sqrt[5]{(-2)^5}$$

$$= \boxed{-2}$$

$$\frac{3^{\frac{1}{5}}}{\sqrt[5]{-96}} = \frac{3^{1/5}}{(-96)^{\frac{1}{5}}} = \left(\frac{3}{-96}\right)^{\frac{1}{5}} = \left(\frac{1}{32}\right)^{\frac{1}{5}} = \frac{\sqrt[5]{1}}{\sqrt[5]{-32}} = \boxed{-\frac{1}{2}}$$

$$\sqrt[4]{\frac{1}{3}} \cdot \sqrt[4]{48} = \sqrt[4]{\frac{1}{3} \cdot 48} = \sqrt[4]{16} = \boxed{2}$$

$$\frac{2^{-4/3}}{54^{-4/3}} = \left(\frac{2}{54}\right)^{-\frac{4}{3}} = \left(\frac{54}{2}\right)^{\frac{4}{3}} = (27)^{\frac{4}{3}} = \left(27^{1/3}\right)^4$$

$$= \left(\sqrt[3]{27}\right)^4$$

$$= (3)^4 = \boxed{81}$$

$$\frac{\sqrt{98}}{2^{1/2}} = \frac{98^{\frac{1}{2}}}{2^{\frac{1}{2}}} = \left(\frac{98}{2}\right)^{\frac{1}{2}} = (49)^{1/2} = \sqrt{49} = \boxed{7}$$

$$\frac{\sqrt[3]{250}}{\sqrt[3]{2}} = \sqrt[3]{\frac{250}{2}} = \sqrt[3]{125} = \boxed{5}$$

$10 \cdot 9^{\frac{t}{2}+2} \cdot 5^{3t}$

$10 \cdot 9^{t/2} \cdot 9^2 \cdot (5^3)^t$

$10 \cdot 3^t \cdot 81 \cdot 125^t$

$10 \cdot 81 \cdot 3^t \cdot 125^t$

$\boxed{810 \cdot 375^t}$

$A \cdot B^t$

$q^{a+b} = q^a \cdot q^b$

$a^{bc} = (a^b)^c$

$q^{\frac{t}{2}} = q^{\frac{1}{2} \cdot t} = (q^{\frac{1}{2}})^t$

$= 3t$

$(ab)^t = a^t b^t$

$$\left(\frac{1}{8}\right)^x + \left(\frac{1}{8}\right)^{x-2}$$

$$\left(\frac{1}{8}\right)^x + \left(\frac{1}{8}\right)^x \cdot \left(\frac{1}{8}\right)^{-2}$$

$$\left(\frac{1}{8}\right)^{-2} \cdot \left(\frac{1}{8}\right)^{2x}$$

$$\left(\frac{8}{1}\right)^2$$

$$(8)^2 \cdot \left(\frac{1}{8}\right)^{2x}$$

$$64 \cdot \left(\frac{1}{8}\right)^{2x}$$

$10 \cdot 9^{\left(\frac{t}{2}+2\right)} \cdot 5^{(3t)}$

$10 \cdot 9^{t/2} \cdot 9^2 \cdot (5^3)^t$

$10 \cdot 3^t \cdot 81 \cdot 125^t$

$10 \cdot 81 \cdot 3^t \cdot 125^t$

$810 \cdot (3 \cdot 125)^t$

$\boxed{810 \cdot 375^t}$

$A \cdot B^t$

$q^{a+b} = q^a \cdot q^b$

$a^{bc} = (a^b)^c$

$q^{t/2} = q^{\left(\frac{1}{2} \cdot t\right)} = \left(q^{\frac{1}{2}}\right)^t$

$(ab)^t = a^t b^t$

$\left(\frac{1}{8}\right)^x + \left(\frac{1}{8}\right)^{x-2}$ as $A \cdot \left(\frac{1}{8}\right)^x$

$\left(\frac{1}{8}\right)^x + \left(\frac{1}{8}\right)^x \cdot \left(\frac{1}{8}\right)^{-2}$

$\left(\frac{1}{8}\right)^{2x} + \left(\frac{8}{1}\right)^2$

$\left(\frac{1}{8}\right)^{2x} + (8)^2$

$\left(\frac{1}{8}\right)^{2x} + 64$

$\left(\frac{1}{8}\right)^{-2}$

$\downarrow$

$\left(\frac{8}{1}\right)^2$

$(8)^2 = 64$

$$\left(\frac{1}{8}\right)^{x} + \left(\frac{1}{8}\right)^{2} + 64$$

$$\frac{4^{11}}{4^{-8}} = 4^{11-(-8)} = 11+8 = 19 = \boxed{4^{19}}$$

$$\frac{a^{-13}}{a^{-6}} = a^{-13-(-6)} = -13+6 = -7 = \boxed{a^{-7}}$$

$$X^{2} \cdot X^{-12} = X^{2+(-12)} = \boxed{X^{-10}}$$

$$(4^{6})(4^{-8}) = 4^{6+(-8)} = \boxed{4^{-2}}$$

$$\frac{6^{-6}}{6^{-5}} = 6^{-6-(-5)} = 6^{-6+5} = \boxed{6^{-1}}$$

$$\frac{y^{-7}}{y^{-13}} = y^{-7-(-13)} = -7+13 = 6 = \boxed{y^{6}}$$

$$z^{-11} \cdot z^{-15} = z^{-11+(-15)} = z^{-11-15} = \boxed{z^{-26}}$$

$$(x^{-3} \cdot y^{3})^{-7} = x^{-3 \cdot -7} \cdot y^{3 \cdot -7} = \boxed{x^{21} \cdot y^{-21}}$$

$$\left(\frac{4^{3}}{5^{-2}}\right)^{5} = \left(\frac{4^{3 \cdot 5}}{5^{-2 \cdot 5}}\right) = \frac{4^{15}}{5^{-10}} = \boxed{4^{15} \cdot 5^{10}}$$

$$(3^{-8} \cdot 7^{3})^{-2} = 3^{-8 \cdot -2} \cdot 7^{3 \cdot -2} = \boxed{3^{16} \cdot 7^{-6}}$$

$$\left(\frac{b^{7}}{4^{5}}\right)^{-3} = \frac{b^{7 \cdot -3}}{4^{5 \cdot -3}} = \frac{b^{-21}}{4^{-15}} = \boxed{\frac{4^{15}}{b^{21}}}$$

$$\frac{4^{-3}}{4^{-1}} = 4^{-3-(-1)} = 4^{-3+1} = 4^{-2} = \boxed{\frac{1}{4^{2}}}$$

$2^x = A^{x/12}$

$a^{b \cdot c} = (a^b)^c$

$2^x = (2^{12})^{x/12}$

$(2^{12})^{x/12}$ $2^{\frac{12 \cdot x}{12}} = 2^{\frac{12x}{12}}$

$= 2^x$

$29^{\frac{x}{2}} = A^x$

$29^{\frac{x}{2}} = (29^{\frac{1}{2}})^x$

$\left(\frac{1}{32}\right)^x \cdot \left(\frac{1}{2}\right)^{9x-5}$

$\left(\frac{1}{2}\right)^{5x} \cdot \left(\frac{1}{2}\right)^{9x-5}$

$\left(\frac{1}{2}\right)^{5x+9x-5} = \left(\frac{1}{2}\right)^{14x-5}$

$\frac{\left(\frac{2}{3}\right)^{x+4} - \left(\frac{2}{3}\right)^x}{\left(\frac{2}{3}\right)^x} = A \cdot \frac{\left(\frac{2}{3}\right)^x}{\left(\frac{2}{3}\right)^x}$

$$\frac{\left(\frac{2}{3}\right)^{x+4}}{\left(\frac{2}{3}\right)^{x}} - \frac{\left(\frac{2}{3}\right)^{x}}{\left(\frac{2}{3}\right)^{x}} = A$$

$$\left(\frac{2}{3}\right)^{x+4-x} - \left(\frac{2}{3}\right)^{x-x} = A$$

$$\left(\frac{2}{3}\right)^{4} - \left(\frac{2}{3}\right)^{0} = A$$

$$\frac{16}{81} - 1 = A$$

$$\boxed{-\frac{65}{81} = A}$$

$3^x = A^{5x}$

$3^x = \left(3^{\frac{1}{5}}\right)^{5x}$

$3^x = 3^x$

$0.9^{60x} = A^x$

$0.9^{60x} = \left(0.9^{60}\right)^x$

$3^{5x+3} \cdot 27^x = 3^{f(x)}$

$3^{5x+3} (3)^{3x} = 3^{f(x)}$

$3^{5x+3+3x} = 3^{f(x)}$

$3^{8x+3} = 3^{f(x)}$

$\boxed{f(x) = 8x + 3}$

$\frac{1}{32} \cdot 2^t = A \cdot B^{\frac{t}{10}-1}$

$2^t = B^{\frac{t}{10}-1}$

$2^t = (2)^{\frac{t}{10}-1}$

$3^{2m} \cdot 4^{2m}$

$(3 \cdot 4)^{2m} = \boxed{12^{2m}}$

$12^{2m} = 144$

$\frac{4^{x+3} - 4^x}{4^x} = \frac{A \cdot 4^x}{4^x}$

$4^{x+3-x} - 4^{x-x}$

$4^3 - 4^0 = 64 - 1 = \boxed{63}$

$\left(\frac{5}{6}\right)^x = A^{-8x}$

$\left(\frac{5}{6}\right)^x = \left(\frac{5}{6}^x\right)^{-8}$

$$\left(\frac{6}{17}\right)^{9x} = A^x$$

$$\left(\left(\frac{6}{17}\right)^9\right)^x \quad \boxed{A = \left(\frac{6}{17}\right)^9}$$

$$q^x \cdot 3^{x+2} = 3^{f(x)}$$

$$\left(3^2\right)^x \cdot 3^{x+2} = 3^{f(x)}$$

$$3^{2x} \cdot 3^{x+2} = 3^{f(x)}$$

$$3^{2x+x+2} = 3^{f(x)}$$

$$3^{3x+2} = 3^{f(x)}$$

$$\boxed{f(x) = 3x + 2}$$

$$q^t \cdot 3 = 81^{0.5t+0.25}$$

$$q^t \cdot 3 = \left(q^2\right)^{0.5t+0.25}$$

$$q^t \cdot 3 = q^{2(0.5t+0.25)}$$

$$q^t \cdot 3 = q^{t+0.5}$$

$$\left(3^2\right)^t \cdot 3 = \left(3^2\right)^{t+0.5}$$

$$3^{2t} \cdot 3 = 3^{2t+1}$$

$$3^{2t} \cdot 3^{1} = 3^{2t+1}$$

$$\boxed{3^{2t+1} = 3^{2t+1}}$$

$$27^{0.5t+0.25} \cdot 3^{0.5t+0.25} = 81^{0.5t+0.25}$$

$$\left(3^{3}\right)^{0.5t+0.25} \cdot 3^{0.5t+0.25} = \left(3^{4}\right)^{0.5t+0.25}$$

$$3^{1.5t+0.75} \cdot 3^{0.5t+0.25} = 3^{2t+1}$$

$$3^{1.5t+0.5t+0.75+0.25} = 3^{2t+1}$$

$$\boxed{3^{2t+1} = 3^{2t+1}}$$

$$\frac{27^{t+0.5}}{3^{t+0.5}} = 81^{0.5t+0.25}$$

$$\frac{(3^3)^{t+0.5}}{3^{t+0.5}} = (3^4)^{0.5t+0.25}$$

$$\frac{3^{3t+1.5}}{3^{t+0.5}} = 3^{2t+1}$$

$$3^{3t+1.5-t-0.5} = 3^{2t+1}$$

$$\boxed{3^{2t+1} = 3^{2t+1}}$$

$$2^{2m} = \frac{64^m}{4^{2m}}$$

$$2^{2m} = \frac{(2^6)^m}{(2^2)^{2m}}$$

$$2^{2m} = \frac{2^{6m}}{2^{4m}}$$

$$2^{2m} = 2^{6m-4m}$$

$$\boxed{2^{2m} = 2^{2m}} \checkmark$$

$$16^{0.5m} = \frac{64^m}{4^{2m}}$$

$$16^{0.5m} = \frac{2^{6m}}{2^{4m}}$$

$$(2^4)^{0.5m} = 2^{2m}$$

$$\boxed{2^{2m} = 2^{2m}} \checkmark$$

$$4^m = \frac{64^m}{4^{2m}}$$

$$4^m = 2^{2m}$$

$$(2^2)^m = 2^{2m}$$

$$\boxed{2^{2m} = 2^{2m}} \checkmark$$

$$\frac{(2^3)^{t^3}}{2^{5t}} = 2^{-3t^3+5t}$$

$$\frac{2^{3t^3}}{2^{5t}} = 2^{-3t^3+5t}$$

$$2^{3t^3-5t} = 2^{-3t^3+5t}$$

Not

$$\frac{8^{t^3}}{32^t} = 2^{-3t^3+5t}$$

$$\frac{\left(2^3\right)^{t^3}}{\left(2^5\right)^t} = 2^{-3t^3+5t}$$

$$\frac{2^{3t^3}}{2^{5t}} = 2^{-3t^3+5t}$$

$$2^{3t^3-5t} = 2^{-3t^3+5t}$$

$$8^{t^3} \cdot 32^t = 2^{-3t^3+5t}$$

$$\left(2^3\right)^{t^3} \cdot \left(2^5\right)^t = 2^{-3t^3+5t}$$

$$2^{3t^3} \cdot 2^{5t} = 2^{-3t^3+5t}$$

$$2^{3t^3+5t} = 2^{-3t^3+5t}$$

$3^{4m} = 27^{0.5m} \cdot 3^{0.5m}$

$3^{4m} = (3^3)^{0.5m} \cdot 3^{0.5m}$

$3^{4m} = 3^{1.5m} \cdot 3^{0.5m}$

$3^{4m} \neq 3^{2m}$

$81^m = 27^{0.5m} \cdot 3^{0.5m}$

$81^m = 3^{2m}$

$(3^4)^m = 3^{2m}$

$3^{4m} \neq 3^{2m}$

$9^{2m} = 27^{0.5m} \cdot 3^{0.5m}$

$(3^2)^{2m} = 3^{2m}$

$3^{4m} \neq 3^{2m}$

$64^{t^3 - 0.5t}$

$(2^6)^{t^3 - 0.5t}$

$2^{6t^3 - 3t}$

$\frac{4^{3t^3}}{8^t} = 2^{6t^3 - 3t}$

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

$\frac{2^{6t^3}}{2^{3t}} = 2^{6t^3 - 3t}$

$\boxed{2^{6t^3 - 3t} = 2^{6t^3 - 3t}}$

$$\frac{64^{t^3}}{8^{2t}} = 2^{6t^3-3t}$$

$$\frac{\left(2^6\right)^{t^3}}{\left(2^3\right)^{2t}} = 2^{6t^3-3t}$$

$$\frac{2^{6t^3}}{2^{6t}} = 2^{6t^3-3t}$$

$$2^{6t^3-6t} \neq 2^{6t^3-3t}$$

$$64^{t^3} \cdot 8^{t} = 2^{6t^3-3t}$$

$$\left(2^6\right)^{t^3} \cdot \left(2^3\right)^{t} = 2^{6t^3-3t}$$

$$2^{6t^3} \cdot 2^{3t}$$

$$2^{6t^3+3t} \neq 2^{6t^3-3t}$$

$$\frac{25^m}{5} = \frac{(5^2)^m}{5} = \frac{5^{2m}}{5} = \frac{5^{2m}}{5^1} = \boxed{5^{2m-1}}$$

- $25^{2m-1} = 5^{2m-1}$

$(5^2)^{2m-1} = 5^{2m-1}$

$\boxed{5^{4m-2} \neq 5^{2m-1}}$

- $25^{m-1} = 5^{2m-1}$

$(5^2)^{m-1} = 5^{2m-1}$

$\boxed{5^{2m-2} \neq 5^{2m-1}}$

- $\boxed{5^{2m-1} = 5^{2m-1}}$

3^{t^2+3t}

- $(3^t)^{t+3}$

$$3^{t^2+3t} = 3^{t^2+3t}$$

- $3^{t^2} \cdot 27^t = 3^{t^2+3t}$

$$3^{t^2} \cdot (3^3)^t = 3^{t^2+3t}$$

$$3^{t^2} \cdot 3^{3t} = 3^{t^2+3t}$$

$$3^{t^2+3t} = 3^{t^2+3t}$$

- $9^t \cdot 27^t = 3^{t^2+3t}$

$$(3^2)^t \cdot (3^3)^t = 3^{t^2+3t}$$

$$3^{2t} \cdot 3^{3t} = 3^{t^2+3t}$$

$$3^{2t+3t} = 3^{t^2+3t}$$

$$3^{5t} \neq 3^{t^2+3t}$$

$26^{9x+5} = 1$

$26^0 = 1$

$26^{9x+5} = 26^0$

$9x + 5 = 0$

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

$\boxed{x = -\frac{5}{9}}$

$2^{3x+5} = 64^{x-7}$

$2^{3x+5} = (2^6)^{x-7}$

$2^{3x+5} = 2^{6x-42}$

$3x + 5 = 6x - 42$

$-3x \quad -3x$

$5 = 3x - 42$

$+42 \quad +42$

$\frac{47}{3} = \frac{3x}{3}$

$\boxed{x = \frac{47}{3}}$

$56^{3x-8} = 1$

$56^0 = 1$

$56^{3x-8} = 56^0$

$3x - 8 = 0$

$\frac{3x}{3} = \frac{8}{3}$

$\boxed{x = \frac{8}{3}}$

$3^{3x-2} = 9^{4x-1}$

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

$3^{3x-2} = 3^{8x-2}$

$3x - 2 = 8x - 2$

$-3x \quad -3x$

$-2 = 5x - 2$

$+2 \quad +2$

$\frac{0}{5} = \frac{5x}{5}$

$\boxed{x = 0}$

$$3^{7-2x} = \left(\frac{1}{27}\right)^{-8}$$

$$3^{7-2x} = \left(27^{-1}\right)^{-8}$$

$$3^{7-2x} = 27^{8}$$

$$3^{7-2x} = \left(3^{3}\right)^{8}$$

$$3^{7-2x} = 3^{24}$$

$$7-2x = 24$$

$$-7 \qquad -7$$

$$\frac{-2x}{-2} = \frac{17}{-2}$$

$$\boxed{x = -\frac{17}{2}}$$

$$\left(\frac{625}{256}\right)^{5x-4} = 1$$

$$\left(\frac{625}{256}\right)^{5x-4} = \left(\frac{625}{256}\right)^{0}$$

$$5x-4 = 0$$

$$+4 \qquad +4$$

$$5x = 4$$

$$\boxed{x = \frac{4}{5}}$$

$32^{\frac{x}{3}} = 8^{x-12}$

$(2^5)^{\frac{x}{3}} = (2^3)^{x-12}$

$2^{\frac{5x}{3}} = 2^{3x-36}$

$\frac{5x}{3} = 3x - 36$

$\cdot 3 \qquad \cdot 3$

$5x = 3(3x - 36)$

$5x = 9x - 108$

$-5x \quad -5x$

$0 = 4x - 108$

$+108$

$\frac{108}{4} = \frac{4x}{4}$

$\boxed{x = 27}$

$\frac{5^{4x+3}}{25^{9-x}} = 5^{2x+5}$

$\frac{5^{4x+3}}{(5^2)^{9-x}} = 5^{2x+5}$

$\frac{5^{4x+3}}{5^{18-2x}} = 5^{2x+5}$

$5^{4x+3-18+2x} = 5^{2x+5}$

$5^{6x-15} = 5^{2x+5}$

$6x - 15 = 2x + 5$

$-2x \qquad -2x$

$4x - 15 = 5$

$+15 \quad +15$

$\frac{4x}{4} = \frac{20}{4}$

$\boxed{x = 5}$

$$\frac{81^{x+7}}{9^{5x-9}} = 9^{4x+1}$$

$$\frac{(9^2)^{x+7}}{9^{5x-9}} = 9^{4x+1}$$

$$\frac{9^{2x+14}}{9^{5x-9}} = 9^{4x+1}$$

$$9^{2x+14-5x+9} = 9^{4x+1}$$

$$9^{-3x+23} = 9^{4x+1}$$

$$-3x+23 = 4x+1$$
$$+3x \qquad +3x$$
$$23 = 7x+1$$
$$-1 \qquad -1$$
$$22 = 7x \rightarrow \boxed{x = \frac{22}{7}}$$

$$\left(\frac{1}{64}\right)^{-2x+6} = \left(\frac{1}{16}\right)^{8x-5}$$

$$\left(64^{-1}\right)^{-2x+6} = \left(16^{-1}\right)^{8x-5}$$

$$\left(\left(2^6\right)^{-1}\right)^{-2x+6} = \left(\left(2^4\right)^{-1}\right)^{8x-5}$$

$$\left(2^{-6}\right)^{-2x+6} = \left(2^{-4}\right)^{8x-5}$$

$$2^{12x-36} = 2^{-32x+20}$$

$$12x-36 = -32x+20$$
$$+32x \qquad +32x$$
$$44x-36 = 20$$
$$+36$$
$$\frac{44x}{44} = \frac{56}{44}$$

$$\boxed{x = \frac{14}{11}}$$

$$27^{9x+4} \cdot 3^{x-8} = 3^{x+9}$$

$$(3^3)^{9x+4} \cdot 3^{x-8} = 3^{x+9}$$

$$3^{27x+12} \cdot 3^{x-8} = 3^{x+9}$$

$$3^{27x+12+x-8} = 3^{x+9}$$

$$3^{28x+4} = 3^{x+9}$$

$$28x+4 = x+9$$

$$-x \quad -x$$

$$27x+4 = 9$$

$$-4 \quad -4$$

$$\frac{27x}{27} = \frac{5}{27}$$

$$\boxed{x = \frac{5}{27}}$$

$$\frac{5^{4x+3}}{25^{9-x}} = 5^{2x+5}$$

$$25^{9-x} = (5^2)^{9-x}$$

$$5^{18-2x}$$

$$\frac{5^{4x+3}}{5^{18-2x}} = 5^{2x+5}$$

$$5^{4x+3-18+2x} = 5^{2x+5}$$

$$5^{6x-15} = 5^{2x+5}$$

$$6x-15 = 2x+5$$

$$-2x \quad -2x$$

$$4x-15 = 5$$

$$+15 \quad +15$$

$$4x = 20$$

$$\frac{4x}{4} = \frac{20}{4}$$

$$\boxed{x = 5}$$

$$\frac{\left(\frac{5}{2}\right)^x + \left(\frac{5}{2}\right)^{x+3}}{\left(\frac{5}{2}\right)^x} = A \cdot \frac{\left(\frac{5}{2}\right)^x}{\left(\frac{5}{2}\right)^x}$$

$$\left(\frac{5}{2}\right)^{x+3-x} + \left(\frac{5}{2}\right)^0 = A$$

$$\left(\frac{5}{2}\right)^3 + 1 = A$$

$$\frac{5^3}{2^3} + 1 = A$$

$$\frac{125}{8} + 1 = A$$

$$\boxed{\frac{133}{8} = A}$$

$$3^{7x+4} = \left(\frac{1}{27}\right)^{x-3}$$

$$3^{7x+4} = \left(27^{-1}\right)^{x-3}$$

$$3^{7x+4} = \left(3^{-3}\right)^{x-3}$$

$$3^{7x+4} = 3^{-3x+9}$$

$$7x+4 = -3x+9$$

$$+3x \qquad +3x$$

$$10x+4 = 9$$

$$-4 \quad -4$$

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

$$\boxed{x = \frac{1}{2}}$$

$\sqrt[3]{-54} \cdot \sqrt[3]{\frac{1}{2}}$

$\sqrt[3]{-54 \cdot \frac{1}{2}}$

$\sqrt[3]{-27}$

$\sqrt[3]{(-3)^3}$

-3

$27^{0.5m} \cdot 3^{0.5m}$

$(3^3)^{0.5m} \cdot 3^{0.5m}$

$3^{1.5m} \cdot 3^{0.5m}$

3^{2m}

$3^{4m} \neq 3^{2m}$

$81^m = 3^{2m}$

$(3^4)^m = 3^{2m}$

$3^{4m} \neq 3^{2m}$

$9^{2m} = 3^{2m}$

$(3^2)^{2m} = 3^{2m}$

$3^{4m} \neq 3^{2m}$

$32^{\frac{x}{3}} = 8^{x-12}$

$(2^5)^{\frac{x}{3}} = (2^3)^{x-12}$

$2^{\frac{5x}{3}} = 2^{3x-36}$

$\frac{5x}{3} = 3x - 36$

$\cdot 3 \quad \cdot 3$

$5x = 3(3x - 36)$

$5x = 9x - 108$

$-9x \quad -9x$

$\frac{-4x}{-4} = \frac{-108}{-4}$

$\boxed{x = 27}$

$(-7)^{\frac{5}{3}} \cdot \left(\frac{1}{56}\right)^{\frac{5}{3}}$

$\left(-\frac{1}{8}\right)^{\frac{5}{3}}$

$\left(\left(-\frac{1}{8}\right)^{\frac{1}{3}}\right)^5$

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

$-\frac{1}{2^5} = \boxed{-\frac{1}{32}}$

$$\frac{3^{\frac{1}{5}}}{\sqrt[5]{-96}}$$

$$\frac{3^{\frac{1}{5}}}{-96^{\frac{1}{5}}} = \left(\frac{1}{-32}\right)^{\frac{1}{5}}$$

$$\sqrt[5]{-32} = \sqrt[5]{-(2)^5}$$

$$-2$$

$$\frac{1}{-2} = \boxed{-\frac{1}{2}}$$

$$\sqrt[5]{-16} \cdot 2^{\frac{1}{5}}$$

$$-16^{\frac{1}{5}} \cdot 2^{\frac{1}{5}}$$

$$-32^{\frac{1}{5}}$$

$$\sqrt[5]{-32}$$

$$\sqrt[5]{-(2)^5}$$

$$\boxed{-2}$$

$$\sqrt[3]{-54} \cdot \sqrt[3]{\frac{1}{2}}$$

$$-54^{\frac{1}{3}} \cdot \left(\frac{1}{2}\right)^{\frac{1}{3}}$$

$$-27^{\frac{1}{3}}$$

$$\sqrt[3]{-27} = \sqrt[3]{-(3^3)}$$

$$\boxed{-3}$$

$$(-7)^{\frac{5}{3}} \cdot \left(\frac{1}{56}\right)^{\frac{5}{3}}$$

$$\left(\frac{-7}{56}\right)^{\frac{5}{3}}$$

$$\left(-\frac{1}{8}\right)^{\frac{5}{3}}$$

$$\left(\left(-\frac{1}{8}\right)^{\frac{1}{3}}\right)^{5}$$

$$\left(\frac{-\sqrt[3]{1}}{\sqrt[3]{8}}\right)^{5}$$

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

$$-\frac{1^5}{2^5} = \boxed{-\frac{1}{32}}$$

$$\sqrt[4]{\frac{x^2}{x^{2/3}}}$$

$$\sqrt[4]{x^{4/3}} = \sqrt[4]{\left(x^{\frac{1}{3}}\right)^4}$$

$$\boxed{x^{\frac{1}{3}}}$$

$$t^{\frac{1}{6}}$$

$$\left(16\sqrt{x^3}\right)^{\frac{1}{4}}$$

$$16^{\frac{1}{4}} \cdot \left(x^{\frac{3}{2}}\right)^{\frac{1}{4}}$$

$$2 \cdot x^{\frac{3}{8}}$$

$$\boxed{2x^{\frac{3}{8}}}$$

$\sqrt[9]{6^4} = 6^{\frac{4}{9}}$

$\left(\frac{7}{3}\right)^x = A^{2x}$

$\frac{\sqrt[3]{2}}{\sqrt[3]{-128}}$

$\frac{2^{\frac{1}{3}}}{(-128)^{\frac{1}{3}}} = \frac{1^{\frac{1}{3}}}{-64^{\frac{1}{3}}}$

$= \sqrt[3]{-\frac{1}{64}} = \sqrt[3]{\left(-\frac{1}{4}\right)^3}$

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

$8^{5x+3} = \left(\frac{1}{64}\right)^{-\frac{2}{3}}$

$8^{5x+3} = \left(64^{-1}\right)^{-\frac{2}{3}}$

$8^{5x+3} = \left(8^{-2}\right)^{-\frac{2}{3}}$

$8^{5x+3} = 8^{4/3}$

$5x+3 = \frac{4}{3}$

-3

$\frac{5x}{5} = -\frac{5}{3} \cdot \frac{1}{5}$

$-\frac{5}{15}$

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

$$64^{x-6} \cdot 4^{9x-3} = 64^{6x+4}$$

$$\left(2^6\right)^{x-6} \cdot \left(2^2\right)^{9x-3} = \left(2^6\right)^{6x+4}$$

$$2^{6x-36} \cdot 2^{18x-6} = 2^{36x+24}$$

$$2^{6x-36+18x-6} = 2^{36x+24}$$

$$2^{24x-42} = 2^{36x+24}$$

$$24x - 42 = 36x + 24$$

$$-24x \qquad -24x$$

$$-42 = 12x + 24$$

$$-24 \qquad -24$$

$$\frac{-66}{12} = \frac{12x}{12}$$

$$\boxed{x = -\frac{11}{2}}$$

$$\frac{10\sqrt[3]{z}}{2z^2}$$

$$\frac{10 \cdot z^{\frac{1}{3}}}{2 \cdot z^2}$$

$$5 \cdot z^{\frac{1}{3}-2}$$

$$\boxed{5 \cdot z^{-\frac{5}{3}}}$$

$64^{t^3-0.5t}$

$(2^6)^{t^3-0.5t} = 2^{6t^3-3t}$

$64^{t^3} \cdot 8^t = 2^{6t^3-3t}$

$(2^6)^{t^3} \cdot (2^3)^t$

$2^{6t^3} \cdot 2^{3t} = 2^{6t^3-3t}$

$2^{6t^3+3t} \neq 2^{6t^3-3t}$

$\frac{4^{3t^3}}{8^t} = 2^{6t^3-3t}$

$\frac{(2^2)^{3t^3}}{(2^3)^t}$

$\frac{2^{6t^3}}{2^{3t}}$

$2^{6t^3-3t} = 2^{6t^3-3t}$

$\frac{64^{t^3}}{8^{2t}} = 2^{6t^3-3t}$

$\frac{(2^6)^{t^3}}{(2^3)^{2t}}$

$\frac{2^{6t^3}}{2^{6t}} = 2^{6t^3-6t} \neq$

$$a^{\frac{1}{5}} = \sqrt[5]{a}$$

$$7^{3-5x} = \left(\frac{1}{49}\right)^{2x+9}$$

$$7^{3-5x} = \left(7^{-2}\right)^{2x+9}$$

$$7^{3-5x} = 7^{-4x-18}$$

$$3-5x = -4x-18$$
$$+5x \quad +5x$$

$$3 = x-18$$
$$+18 \quad +18$$

$$\boxed{x = 21}$$