

(1)

Powers w/ Variable Bases

KEY

$$1. a) c^{-4} = \boxed{\frac{1}{c^4}} \quad b) (-x)^{-2} = \frac{1}{(-x)^2} = \boxed{\frac{1}{x^2}} \quad c) 3x^{-3} = \boxed{\frac{3}{x^3}}$$

$$d) 4m^3n^{-2} = \frac{4m^3}{n^2} \quad e) -5x^3y^{-2} = \boxed{\frac{-5}{x^3y^2}} \quad f) \frac{1}{a^{-3}} = \boxed{a^3}$$

$$g) \frac{3}{x^{-4}} = \boxed{3x^4} \quad h) \frac{a^{-2}}{b^{-5}} = \boxed{\frac{b^5}{a^2}} \quad i) \left(\frac{x}{y^2}\right)^{-5} = \left(\frac{y^2}{x}\right)^5 = \boxed{\frac{y^{10}}{x^5}}$$

$$j) \left(\frac{-2a}{b}\right)^{-3} = \left(\frac{-b}{2a}\right)^3 = \boxed{-\frac{b^3}{8a^3}}$$

$$2. a) c^{-4} \cdot c^{-3} = c^{-7} = \boxed{\frac{1}{c^7}} \quad b) \frac{m^3}{m^{-6}} = \boxed{m^9} \quad c) (a^{-3})^2 = a^{-6} = \boxed{\frac{1}{a^6}}$$

$$d) (4xy^{-3})^{-2} = 4^{-2}x^{-2}y^6 = \boxed{\frac{y^6}{16x^2}} \quad e) -4x(5x)^3 = -4x(125x^3) = \boxed{-500x^4} \quad f) \left(\frac{m^{-2}}{n^{-4}}\right)^{-3} = \boxed{\frac{m^6}{n^{12}}}$$

$$g) (2xy^2)(3x^{-1}y^0) = 6x^0y^2 = \boxed{6y^2} \quad h) (-3m^2)(-4m^4n^{-2}) = 12m^6n^{-1} = \boxed{\frac{12m^6}{n}}$$

$$i) \left(\frac{mn^3}{m^2n}\right)^2 = \left(\frac{m^{-1}n^2}{m^1n^4}\right)^2 = \left(\frac{n^4}{m^8}\right)^2 = \boxed{\frac{n^8}{m^{16}}} \quad j) \left(\frac{6a^{-3}b^5}{4a^2b^3}\right)^{-3} = \left(\frac{\frac{3}{2}a^{-5}b^2}{\frac{2}{3}a^{15}b^{-6}}\right)^{-3} = \left(\frac{\frac{2}{3}a^{15}b^{-6}}{\frac{3}{2}a^{-5}b^2}\right)^{-3} = \left(\frac{8a^{15}}{27b^8}\right)^{-3} = \boxed{\frac{27b^8}{8a^{15}}} \quad k) \frac{x^3y^{-2}}{(xy^4)(x^5y^3)} = \frac{x^3y^{-2}}{x^6y^{14}} = x^{-3}y^{-16} = \boxed{\frac{1}{x^3y^{16}}}$$

$$3. a) a^{\frac{2}{3}} \cdot a^{\frac{5}{3}} = a^{\frac{7}{3}} = \boxed{a^{\frac{7}{3}}}$$

$$b) x^{\frac{1}{2}} \cdot (x^{\frac{1}{6}})^2 = x^{\frac{1}{2}} \cdot x^{\frac{2}{6}} = x^{\frac{1}{2}} \cdot x^{\frac{1}{3}} = x^{\frac{2}{6} + \frac{2}{6}} = x^{\frac{4}{6}} = x^{\frac{2}{3}} = \boxed{x^{\frac{2}{3}}}$$

$$c) 3m^{\frac{2}{3}} \cdot m^{\frac{1}{3}} = 3m^{\frac{2}{3} + \frac{1}{3}} = 3m^1 = \boxed{3m}$$

$$d) x^{\frac{1}{4}} \div x^{-\frac{3}{4}} = x^{\frac{1}{4} - (-\frac{3}{4})} = x^{\frac{1}{4} + \frac{3}{4}} = x^1 = \boxed{x}$$

$$e) y^{\frac{2}{3}} \div y^{\frac{1}{3}} = y^{\frac{2}{3} - \frac{1}{3}} = y^{\frac{1}{3}} = \boxed{y^{\frac{1}{3}}}$$

$$f) (c^{\frac{3}{5}})^5 = \boxed{c^3}$$

$$g) (x^{\frac{2}{3}} \cdot y^{\frac{4}{3}})^3 = \boxed{x^2 y^4}$$

$$h) \left(\frac{25c^6}{16b^4} \right)^{\frac{1}{2}} = \boxed{\frac{5c^3}{4b^2}}$$

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

$$j) \sqrt{\frac{a^9 b^4}{a^7 b^0}} = (a^2 b^4)^{\frac{1}{2}} = \boxed{ab^2}$$

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

$$4. a) c^{-\frac{1}{5}} \cdot c^{-\frac{6}{5}} = c^{-\frac{7}{5}} = \boxed{c^{-\frac{7}{5}}}$$

$$b) \frac{m^{\frac{1}{2}}}{m^{-\frac{5}{6}}} = m^{\frac{1}{2} - (-\frac{5}{6})} = m^{\frac{1}{2} + \frac{5}{6}} = m^{\frac{3}{6} + \frac{5}{6}} = m^{\frac{8}{6}} = m^{\frac{4}{3}} = \boxed{m^{\frac{4}{3}}}$$

$$c) (a^{\frac{1}{9}})^{-3} = a^{-\frac{1}{3}} = \boxed{\frac{1}{a^{\frac{1}{3}}}} \text{ or } \boxed{\frac{1}{\sqrt[3]{a}}}$$

$$d) (x^{\frac{1}{4}} \cdot y^{-\frac{1}{3}})^{-12} = x^{-3} y^4 = \boxed{\frac{y^4}{x^3}}$$

$$e) \frac{(x^3)^{-\frac{1}{2}}}{(x^{\frac{5}{2}})^{\frac{1}{5}}} = \frac{x^{-\frac{3}{2}}}{x^{\frac{1}{5}}} = x^{-\frac{3}{2} - \frac{1}{5}} = x^{-\frac{15}{10} - \frac{2}{10}} = x^{-\frac{17}{10}} = \boxed{\frac{1}{x^{\frac{17}{10}}}}$$

$$5. a) x^0 = \boxed{1}$$

$$b) \frac{3}{b^0} = \frac{3}{1} = \boxed{3}$$

$$c) \left(\frac{2x^3 y^2}{15xy^3} \right)^0 = \boxed{1}$$

$$d) x^0 \cdot (-8x^{-6})^{\frac{1}{3}} = 1(\sqrt[3]{-8x^{-2}}) = \boxed{\frac{-2}{x^2}}$$