

1.  $\left(\frac{3^3 a^4 b^6}{3^1 a^{-2} b^2}\right)^3$

$2 = 6$   
 $2 = 4$

$$= (3^2 a^6 b^4)^3$$
$$= 3^6 a^{18} b^{12}$$

$= 729 a^{18} b^{12}$

2.  $\left(\frac{x^{-9} y^{-3}}{x^{-3} y^6}\right)^2$

$-9 + 3 = -6$   
 $-3 - 6 = -9$

$$= (x^{-6} y^{-9})^2$$
$$= x^{-12} y^{-18}$$

$= \frac{1}{x^{12} y^{18}}$

2-

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

$$= 5 - 4$$
$$3 - 1$$

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

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

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

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

$$4. m^{-3}n^8 \times \frac{m^2n^4}{m^{-2}n^3}$$

$$= m^{-3}n^8 \times m^4n^1$$

$$= m^1n^9$$

$$5. \quad \frac{9(a^3)^3 \times (2a^3)^2}{6a^4}$$

$$= \frac{9a^6 \times 2^2 a^6}{6a^4}$$

$$= \frac{9a^6 \times 4a^6}{6a^4}$$

$$= \frac{36a^{12}}{6a^4}$$

$$= \boxed{6a^8}$$

$$6. \quad \frac{3^3 a^{\frac{1}{2}}}{9 a^{-\frac{2}{3}}}$$

$$= \frac{27 a^{\frac{1}{2}}}{9 a^{-\frac{2}{3}}}$$

$$= \boxed{3a^{7/6}}$$

$$\frac{1^3 \times 2^2}{2 \times 3 \times 2}$$

$$\frac{3}{6} + \frac{4}{6}$$

$$= \frac{7}{6}$$

$$7. \frac{3^{-1} m^4 n^{-2}}{2^{-1} m^1 n^4} \quad \begin{array}{l} 4-1=3 \\ -2-4=-6 \end{array}$$

$$= \frac{3^{-1} m^3 n^{-6}}{2^{-1}}$$

$$= \frac{2m^3}{3n^6}$$

$$9. r^5 s^{-3} \times (r^4 s^1)^3$$

$$= r^5 s^{-3} \times r^{12} s^3$$

$$= r^{17} s^0$$

$$= r^{17} (1)$$

$$= r^{17}$$

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

$$= \frac{a^{-4} b^2}{a^{12} b^4} \quad \begin{array}{l} -4-12 \\ 2-4=-2 \end{array}$$

$$= a^{-16} b^{-2}$$

$$= \frac{1}{a^{16} b^2}$$

$$10. \left( \frac{5^3 g^5 h^4}{5^1 g^{-3} h^2} \right)^2$$

$$= \left( 5^2 g^8 h^2 \right)^2 \quad \begin{array}{l} 5+3 \\ =8 \\ 4-2=2 \end{array}$$

$$= 5^4 g^{16} h^4$$

$$= 625 g^{16} h^4$$

11.  $\left( \frac{a^{-5}b^3 \times a^{-2}b^1}{a^{-7}b^2} \right)^{-4}$

$-7+7=0$   
 $4-2=2$

$$= \left( \frac{a^{-7}b^4}{a^{-7}b^2} \right)^{-4}$$
$$= (a^0 b^2)^{-4}$$
$$= a^0 (b^{-8})$$
$$= \frac{a^0}{b^8}$$
$$\boxed{= \frac{1}{b^8}}$$

$$\begin{aligned} 12. \quad & \frac{2^2 a^4 \times 3^2 a^{-2} b^1}{12 a^{-4}} \\ & = \frac{4 a^4 \times 9 a^{-2} b^1}{12 a^{-4}} \\ & = \frac{36 a^2 b^1}{12 a^{-4}} \quad 2 + 4 = 6 \\ & = \boxed{3 a^6 b^1} \end{aligned}$$