

Simplify. Your answer should contain only positive exponents.

1) $n^0 n^3$

$$1(n^3)$$

$$\boxed{n^3}$$

2) $x^2 \cdot 3x$

$$(1)(3) \cdot x^2 \cdot x^1$$

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

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

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

5) $(2yx^{-3})^{-4} = 2^{-4} y^{-4} x^{12}$
$$= \frac{1 \cdot x^{12}}{2^4 y^4}$$

$$= \boxed{\frac{x^{12}}{16y^4}}$$

6) $(2u^{-4}v^3)^2 = 2^2 u^{-8} v^6$
$$= \frac{4}{1} \left(\frac{1}{u^8}\right) \frac{v^6}{1}$$

$$= \boxed{\frac{4v^6}{u^8}}$$

7) $2yx^{-4} \cdot (2y^{-1})^2$

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

$$2^2 \cdot 2^1 \cdot y \cdot \frac{1}{y^2} \cdot \frac{1}{x^4}$$

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

8) $2x^4 y^2 \cdot (x^{-3} y^{-2})^{-3}$

$$2x^4 y^2 \cdot x^9 y^6$$

$$2x^{4+9} y^{2+6}$$

$$\boxed{2x^{13} y^8}$$

$$9) x^{-1} \cdot (2x^2y^3)^{-2}$$

$$\frac{1}{x} \cdot 2^{-2} x^{-4} y^{-6}$$

$$\frac{1}{x} \cdot \frac{1}{2^2} \cdot \frac{1}{x^4} \cdot \frac{1}{y^6}$$

$$\frac{1}{4x^{1+4}y^6} = \boxed{\frac{1}{4x^5y^6}}$$

$$11) \frac{(2y^0)^2}{x^3 \cdot 2x^3y^{-1}} = \frac{2^2 y}{2x^{3+3}}$$

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

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

$$13) \frac{y^{-2} \cdot 2x}{(2x^{-3})^2} = \frac{2x}{y^2 \cdot 4x^{-6}}$$

$$= \frac{2x^{1+6}}{y^{2 \cdot 4}}$$

$$= \frac{2x^7}{4y^2} = \boxed{\frac{x^7}{2y^2}}$$

$$15) \left(\frac{2x^{-3}y^0 \cdot x^{-3}y^{-1}}{2x^{-3}y^4} \right)^3 = \left(\frac{2x^{-6}y^{-1}}{2x^{-3}y^4} \right)^3$$

$$\boxed{\frac{1}{x^9 y^{15}}}$$

$$(x^{-6+3} y^{-1-4})^3$$

$$(x^{-3} y^{-5})^3$$

$$\frac{x^{-9} y^{-15}}{1}$$

$$10) x^{-2}y^3 \cdot (2x^2y^4)^2$$

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

$$\frac{4x^4y^{3+8}}{x^2} = 4x^{4-2}y^{11}$$

$$= \boxed{4x^2y^{11}}$$

$$12) \frac{(x^0y^{-1})^4 \cdot 2x^2y^4}{2yx^{-1} \cdot (2x^4y^{-3})^2}$$

$$\frac{y^{-4} \cdot 2 \cdot x^2 \cdot y^4}{2yx^{-1} \cdot 2^2 x^8 y^{-6}}$$

$$\frac{2x^2}{2^3 x^{1+8} y^{1-6}}$$

$$\frac{x^{-5} \cdot y^5 \cdot \frac{y^5}{4x^5}}{4} = \frac{2x^2}{8x^7y^{-5}}$$

$$= \frac{2x^2}{4x^{2-7}y^5}$$

$$14) \frac{b^0}{(2b^{-3} \cdot a^3b^{-3})^3} = \frac{1}{(2a^3b^{-6})^3} = \frac{1}{2^3 a^9 b^{-18}}$$

$$\boxed{\frac{b^{18}}{8a^9}}$$

$$16) \left(\frac{uv^3}{u \cdot u^0v^{-1} \cdot u^3v^0} \right)^{-4} = \left(\frac{v^4}{u^4v^{-1}} \right)^{-4}$$

$$\boxed{\frac{u^4}{v^8}}$$

$$(v^{1+1}u^{-1})^{-4}$$

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

$$v^{-8}u^4$$