

1. Simplify each of the following using the properties of exponents. Your answer should contain only positive exponents.

(a) $(a^4b^7)^3 \cdot b^3$

(c) $\frac{7a^5b^{-3}}{21a^3b^{-5}}$

(e) $\left(\frac{5x^5y^4}{10x^2y^{-3}}\right)^3$

(b) $(2y^4)^{-2} \cdot 16y^{\frac{2}{5}}$

(d) $\frac{(x^{-4})^3(x^3)^{-4}}{x^{12}}$

(f) $\left(\frac{a^3b^2c}{a^{-1}b^{-2}c^{-3}}\right)^{-2}$

2. Simplify each of the following using the properties of radicals.

(a) $\sqrt{16}$

(b) $\sqrt{-9}$

(c) $\sqrt{144 + 25}$

(d) $\sqrt{144} + \sqrt{25}$

(e) $7\sqrt{2} - 5\sqrt{2} + 3\sqrt{2}$

3. Simplify each of the following using the properties of radicals. Your answers should be rationalized. You may assume that all variables represent positive real numbers.

(a) $\sqrt{25x^2y^4z^6}$

(b) $\sqrt{8x^5y^6z^3}$

(c) $\sqrt{27x^3y^4z^5}$

(d) $\sqrt[3]{8x^3y^6}$

$$(e) \sqrt[3]{25x^3y^7}$$

$$(g) \frac{\sqrt{5}}{\sqrt{3}}$$

$$(i) \frac{\sqrt{8x^3y^2}}{\sqrt{4xy^5}}$$

$$(k) \sqrt[3]{\frac{x^2y^{-2}}{5xy^3}}$$

$$(f) \sqrt[3]{4x^5y^{10}z^6}$$

$$(h) \frac{\sqrt{3y}}{\sqrt{2x}}$$

$$(j) \sqrt{\frac{3x^2y}{6xy^3}}$$

$$(l) \frac{4}{3 - \sqrt{x}}$$

4. Simplify each of the following using the properties of exponents.

$$(a) 27^{\frac{2}{3}}$$

$$(d) 3y^{\frac{1}{4}} \cdot 2y^{\frac{2}{3}}$$

$$(g) (16x^4y^8)^{\frac{1}{2}}$$

$$(b) 27^{-\frac{4}{3}}$$

$$(e) \frac{4x^{\frac{3}{4}}}{x^{\frac{1}{4}}}$$

$$(h) \frac{x^5}{x^{\frac{1}{3}}}$$

$$(c) x^{\frac{1}{2}} \cdot x^{\frac{1}{2}}$$

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

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