

$$(1) \frac{15^{-1} x^{-1} (y^3)^{-1}}{3^{-1} (y^2)^{-1}} = \frac{3 y^{-3}}{15 x y^{-2}} = \frac{1 y^{-3-2}}{5x} = \frac{1 y^{-5}}{5x} = \frac{1}{5x^4}$$

$$(2) \frac{4^{-2} a^{-6} b^6}{a^2 b^{-4}} = \frac{a^{-6-2} b^{6-4}}{4^2} = \frac{a^{-8} b^2}{16} = \frac{b^2}{16a^8}$$

$$(3) a^{-12} \cdot b^8 \cdot (-2)^{-3} a^{-9} b^{-21} = \frac{1 a^{-12-9} b^{8-21}}{-8} = \frac{a^{-21} b^{-13}}{-8}$$

$$\frac{1}{-8a^{21} b^{13}}$$

$$(4) 36^{\frac{1}{4} + \frac{1}{4}} = 36^{\frac{1}{2}} = \sqrt{36} = 6$$

$$(5) (x^{-4/3})^{15} (y^{3/5})^{15} = x^{-20} y^9 = \frac{y^9}{x^{20}}$$

$$(6) -32^{\frac{2}{5}} (x^{-10})^{\frac{2}{5}} (y^{15})^{\frac{2}{5}} = (\sqrt[5]{-32})^2 x^{-4} y^6 = \frac{4y^6}{x^4}$$

$$(7) \frac{81^{\frac{1}{4}} (y^{16})^{\frac{1}{4}}}{16^{\frac{1}{4}} (x^{12})^{\frac{1}{4}}} = \frac{\sqrt[4]{81} y^4}{\sqrt[4]{16} x^3} = \frac{3y^4}{2x^3}$$

$$(8) \frac{x^{\frac{2}{6}}}{x^{\frac{5}{3}}} = x^{\frac{2}{6} - \frac{5}{3}} = x^{-\frac{4}{3}} = \frac{1}{x^{\frac{4}{3}}} = \frac{1}{x^{\frac{1}{3}}} = \frac{1}{x\sqrt[3]{x}}$$

$$(9) \quad 81^{-3/4} = (\sqrt[4]{81})^{-3} = 3^{-3} = \frac{1}{27}$$

$$(10) \quad \sqrt{36x^3} = \sqrt{36} (x^3)^{1/2} = 6x^{3/2} = 6x^{1\frac{1}{2}} = 6x\sqrt{x}$$

$$(11) \quad \sqrt[3]{4} \cdot \sqrt[3]{18} = \sqrt[3]{72} = \sqrt[3]{8 \cdot 9} = 2\sqrt[3]{9}$$

$$(12) \quad \sqrt{5a^3} \cdot \sqrt{20a^4} = \sqrt{100a^7} = \sqrt{100} a^{7/2} = 10a^{3\frac{1}{2}} \\ = 10a^3\sqrt{a}$$

$$(13) \quad \frac{\sqrt{80}}{\sqrt{6}} = \sqrt{\frac{80}{6}} = \sqrt{\frac{40}{3}} \quad \text{or} \quad \frac{\sqrt{40}}{\sqrt{3}} = \frac{2\sqrt{10}}{\sqrt{3}}$$

$$(14) \quad \sqrt{\frac{18x^5y}{2x^6}} = \sqrt{9x^{-1}y} = \sqrt{\frac{9y}{x}} = 3\sqrt{\frac{y}{x}} \quad \text{or} \quad \frac{3\sqrt{y}}{\sqrt{x}}$$

$$(15) \quad \sqrt[3]{\frac{640w^3z^8}{5wz^4}} = \sqrt[3]{128w^2z^4} = \sqrt[3]{128} w^{2/3} z^{4/3} \\ = \sqrt[3]{64 \cdot 2} w^{2/3} z^{4/3} \\ = 4z\sqrt[3]{2 \cdot w^2z}$$

$$(16) \quad 2\sqrt{7} + 3\sqrt{7} = 5\sqrt{7}$$

$$(17) \quad \sqrt[16]{32} + \sqrt[4]{8} = 4\sqrt{2} + 2\sqrt{2} = 6\sqrt{2}$$

$$(18) \quad 8\sqrt[9]{45} - 3\sqrt[16]{80} = 24\sqrt{5} - 12\sqrt{5} = 12\sqrt{5}$$

$$(19) \quad (2 + \sqrt{5})(3 + \sqrt{5}) = 6 + 2\sqrt{5} + 3\sqrt{5} + 5 = 11 + 5\sqrt{5}$$

$$(20) \quad (\sqrt{10} + 3)(\sqrt{10} + 3) = 10 + 3\sqrt{10} + 3\sqrt{10} + 9 = 19 + 6\sqrt{10}$$

$$(21) \quad (3\sqrt{5} - 2)(3\sqrt{5} + 2) = 9(5) + 6\sqrt{5} - 6\sqrt{5} - 4 = 45 - 4 = 41$$

$$(22) \quad \frac{4\sqrt{2x+1}}{4} = \frac{12}{4}$$

$$\sqrt{2x+1} = 3$$

$$(\sqrt{2x+1})^2 = 3^2$$

$$2x+1 = 9$$

$$2x = 8$$

$$x = 4 \text{ check works}$$

$$(23) \quad \sqrt{3x-2} = x-2$$

$$(\sqrt{3x-2})^2 = (x-2)^2$$

$$3x-2 = x^2 - 4x + 4$$

$$0 = x^2 - 7x + 6$$

$$0 = (x-6)(x-1)$$

$$6 \text{ or } \cancel{1}$$

extraneous

(24)

$$\frac{4x^{\frac{2}{3}}}{4} = \frac{36}{4}$$

$$x^{\frac{2}{3}} = 9$$

$$\left(x^{\frac{2}{3}}\right)^{\frac{3}{2}} = 9^{\frac{3}{2}}$$

$$x = (\sqrt{9})^3$$

$$x = 27 \text{ check works}$$

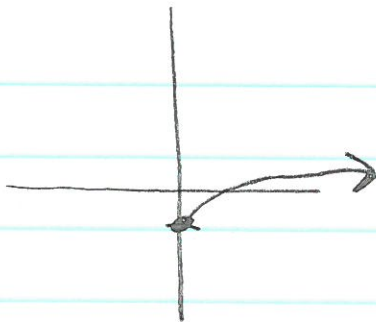
(25)

$$y = \sqrt{x}$$

down 1

$$D: x \geq 0$$

$$R: y \geq -1$$



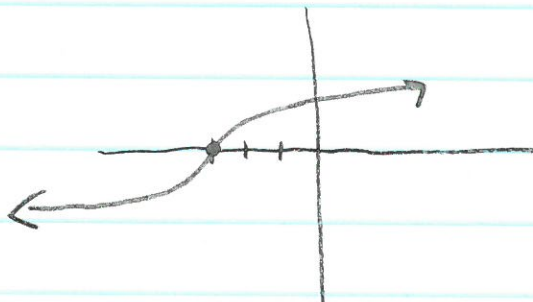
(26)

$$y = \sqrt[3]{x}$$

left 3

$$D: \mathbb{R}$$

$$R: \mathbb{R}$$



(27)

$$y = \sqrt{x}$$

reflect over x-axis

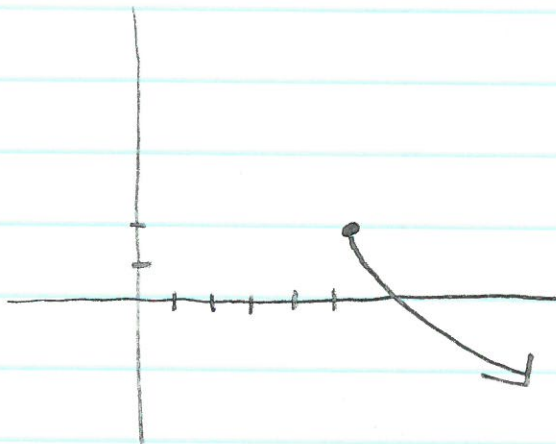
steeper

right 5

up 2

$$D: x \geq 5$$

$$R: y \leq 2$$



(28)

$$y = \sqrt[3]{x}$$

reflect over x-axis

right 2

down 3

$$D: \mathbb{R}$$

$$R: \mathbb{R}$$

