

3. Simplificar, utilizando las propiedades de las potencias:

$$\begin{array}{llll}
 \text{a) } \frac{2^3 \cdot 5^4 \cdot 3^2 \cdot (-7)^{-6}}{(-2)^4 \cdot 7^3 \cdot 5^2 \cdot 3^{-3}} & \text{b) } \frac{(2^2 \cdot 3)^5 \cdot a^{-9} \cdot x^5 \cdot 5}{3 \cdot 5 \cdot x^4 \cdot a^{-11} \cdot (2^2 \cdot 5)^{-3}} & \text{c) } \frac{(-3 \cdot 5^{-4})^{-7} \cdot (2 \cdot 3^2)^5}{(5^2 \cdot 3^4)^{-7} \cdot (-2)^6} & \text{d) } \frac{27^5 \cdot 3^{-8} \cdot 9^4}{(-81) \cdot 3^8}
 \end{array}$$

4. Realizar las siguientes operaciones:

$$\begin{array}{ll}
 \text{a) } \left(\frac{2}{3}\right)^5 \cdot \left(\frac{4}{9}\right)^{-3} - \frac{5}{4} \cdot (-3) + \left(\frac{2}{5}\right)^{-2} & \text{b) } \frac{\frac{4}{3} + 2^3 \cdot \frac{5}{4} - 7}{5^{-1} + \left(\frac{5}{2}\right)^{-1}}
 \end{array}$$

5. Realizar las siguientes operaciones con radicales, siempre que sea posible:

$$\begin{array}{llll}
 \text{a) } \sqrt{3^5 \cdot 2^3 \cdot 6^2} \cdot \sqrt{4^3 \cdot 8 \cdot 27} & \text{b) } \sqrt[5]{3} \cdot \sqrt[4]{3^3} \cdot \sqrt{3} \cdot \sqrt[10]{3^6} & \text{c) } \frac{\sqrt[4]{x^2}}{\sqrt{x}} & \text{d) } \sqrt[7]{9^2} \cdot \sqrt[7]{3^5} : \sqrt[7]{27} \\
 \text{e) } \sqrt{45} - \sqrt{27} - 3\sqrt{\frac{20}{9}} + \sqrt{80} + \sqrt{12} & \text{f) } 2 \cdot \sqrt[3]{2} + 5 \cdot \sqrt[3]{54} + 3 \cdot \sqrt[3]{-250} - 7 \cdot \sqrt[3]{2}
 \end{array}$$

6. Extrae las siguientes raíces:

$$\begin{array}{llll}
 \sqrt{64} = & \sqrt{\frac{4}{225}} = & \sqrt{-16} = & \sqrt[3]{\frac{-27}{64}} = \\
 \sqrt[3]{\frac{1}{729}} = & \sqrt{144} = & \sqrt{81} = & \sqrt[3]{\frac{-8}{125}} = \\
 \sqrt{-25} = & \sqrt[3]{64} = & &
 \end{array}$$

$$\begin{array}{cccc}
\sqrt[3]{-27} = & \sqrt[3]{-216} = & \sqrt[3]{\frac{216}{343}} = & \sqrt[3]{729} = \\
\sqrt[3]{\frac{729}{512}} = & \sqrt[3]{-125} = & \sqrt[4]{16} = & \sqrt[3]{\frac{b^6}{216}} = \\
\sqrt[4]{-81} = & \sqrt[3]{\frac{-1}{27b^6}} = & \sqrt[4]{625} = & \sqrt[4]{-1296} = \\
\sqrt[5]{\frac{-32}{b^{10}}} = & \sqrt{4x^6y^{12}} = & \sqrt[4]{14641} = & \\
\sqrt[5]{-32} = & \sqrt[5]{243} = & \sqrt[5]{a^{10}} = & \\
\sqrt[3]{8b^3} = & \sqrt[5]{-3125} = & & \\
\sqrt[4]{-1296b^8} = & \sqrt[5]{-243b^{15}} = & \sqrt[5]{-1024b^{10}x^{15}} = & \\
\sqrt[5]{1024} = & \sqrt{\frac{1}{64}} = & & \\
\sqrt{2,7} = & \sqrt{\frac{9}{25}} = & \sqrt{7,1} = & \sqrt{\frac{-16}{36}} = \\
\sqrt{\frac{-25}{144}} = & \sqrt[3]{\frac{-27x^6}{125a^3b^9}} = & \sqrt[3]{-343b^9} = & \sqrt[5]{32b^{80}} = \\
\sqrt{\frac{1}{4}b^6} = & \sqrt[3]{\frac{-27}{64}x^{12}m^6} = & \sqrt[7]{-128m^{14}c^{42}} = & \sqrt[4]{81c^8m^{12}} = \\
\sqrt[3]{\frac{-8}{729}b^6m^{36}} = & \sqrt[3]{0,001} = & &
\end{array}$$

7. Extraer los factores posibles:

$$\begin{array}{cccc}
\sqrt{216b^4} = & \sqrt{1024b^5} = & \sqrt{36b^3x^{12}} = & \sqrt{\frac{1}{4}b^3} = \\
\sqrt{\frac{1}{32}b} = & \sqrt{\frac{18b^6}{75b^3}} = & \sqrt[3]{8b^6c^5} = & \sqrt[3]{125b^4x^7} = \\
\sqrt[3]{64b^{12}x^9y^6} = & \sqrt[4]{1024x^5} = & \sqrt[4]{243b^7} = & \sqrt[4]{32b^5m^9} =
\end{array}$$

8. Extrae los factores posibles de cada radical:

$$\sqrt[3]{81b^7} = \quad \sqrt[5]{128m^{10}} = \quad \sqrt[7]{256b^{14}c^{11}} = \quad \sqrt[5]{3125m^{10}c^{13}b^{37}} =$$

$$\sqrt[4]{b^7m^3} = \quad \sqrt[5]{1024m^{37}c^{18}} = \quad \sqrt{2,7b^3} = \quad \sqrt[3]{\frac{216}{343}m^{12}b^{15}c} =$$

$$\sqrt[3]{0,001b^7} = \quad \sqrt[3]{\frac{8}{729}b^5m^{14}} = \quad \sqrt[5]{\frac{1}{243}b^7m^{45}} = \quad \sqrt{324b^3x} =$$

9. Reduce a común índice:

$$\text{a) } \sqrt{b} \quad , \quad \sqrt[3]{b^2} \quad , \quad \sqrt[6]{b^5} \quad , \quad \sqrt[10]{b^3} \quad \text{b) } \sqrt{mx} \quad \sqrt[5]{m^3x^2} \quad \sqrt[6]{m^5x} \quad \sqrt[3]{x^4y^2}$$

$$\text{c) } \sqrt{2} \quad \sqrt[4]{8} \quad \sqrt[3]{16} \quad \sqrt[6]{32} \quad \text{d) } \sqrt[3]{3} \quad \sqrt[5]{81} \quad \sqrt{3} \quad \sqrt[4]{27}$$

$$\text{e) } \sqrt{3x} \quad \sqrt[3]{9x^2} \quad \sqrt[4]{5x^3} \quad \sqrt[10]{6x^9} \quad \text{f) } \sqrt{2xy} \quad \sqrt[3]{3xy^2} \quad \sqrt[4]{4x^3y^3} \quad \sqrt[6]{6x^5y^3}$$

10. Introduce los factores en el radical y simplifica:

$$2x\sqrt{x} \quad 3mx^2\sqrt{\frac{1}{3}mx} \quad \frac{4x}{3}\sqrt{\frac{9}{4}xy} \quad \frac{3}{8}\sqrt{\frac{2}{27}x}$$

$$3\sqrt[3]{3} \quad \frac{2}{3}\sqrt[3]{9} \quad \frac{2a}{3}\sqrt[3]{\frac{9a}{16}}$$

11. Racionaliza las siguientes expresiones:

$$\frac{1}{\sqrt{3}} = \quad \frac{1}{\sqrt{2}} = \quad \frac{a}{\sqrt{a}} =$$

$$\frac{2}{3\sqrt{2}} = \quad \frac{3}{2\sqrt{3}} = \quad \frac{a}{b\sqrt{a}} =$$

12. Racionaliza las siguientes expresiones:

$$\frac{a}{\sqrt{m}} = \frac{5}{\sqrt{3}} = \frac{a}{a+\sqrt{b}} = \frac{2}{\sqrt{3}-1} = \frac{a+b}{\sqrt{a}-\sqrt{b}} =$$

$$\frac{2}{\sqrt{5}-\sqrt{3}} = \frac{\sqrt{a}-\sqrt{b}}{\sqrt{b}-\sqrt{a}} = \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}} = \frac{a}{\sqrt[3]{a^3}} = \frac{2}{\sqrt[3]{2^3}} =$$

$$\frac{m}{q\sqrt[3]{m^2}} = \frac{3}{5\sqrt[3]{3^2}} = \frac{\sqrt{a}+\sqrt{x}}{\sqrt{x}-\sqrt{a}} = \frac{2\sqrt{x}-2\sqrt{y}}{2\sqrt{y}-2\sqrt{x}} = \frac{4}{\sqrt{5}-1} =$$

$$\frac{3}{3+\sqrt{6}} = \frac{3}{4-\sqrt{13}} = \frac{5}{2\sqrt[3]{5}} = \frac{3}{2\sqrt[4]{3^3}} = \frac{7}{3\sqrt[6]{7^4}} =$$

$$\frac{3}{2\sqrt[8]{3^5}} = \frac{3}{\sqrt{6}} = \frac{2}{5\sqrt{2}} = \frac{\sqrt{2}}{\sqrt{2}-1} = \frac{2}{\sqrt{2}+1} =$$

$$\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}} = \frac{1-\sqrt{3}}{1+\sqrt{3}} = \frac{2}{5\sqrt[5]{b^3}} = \frac{\sqrt{a+b}}{\sqrt{a}+\sqrt{b}} =$$

13. Calcula el valor de estas expresiones:

$$a) \frac{2}{\sqrt{5}-\sqrt{3}} - \frac{2}{\sqrt{3}-1} - \frac{4}{\sqrt{5}-1} =$$

$$b) \frac{3}{\sqrt{6}+\sqrt{3}} + \frac{2}{\sqrt{3}+1} - \frac{5}{\sqrt{6}+1} =$$

$$c) \frac{5}{\sqrt{7}-\sqrt{2}} - \frac{1}{\sqrt{2}+1} - \frac{6}{\sqrt{7}+1} =$$

$$d) \frac{2}{\sqrt{7}-\sqrt{5}} - \frac{3}{\sqrt{7}-2} - \frac{1}{\sqrt{5}-2} =$$

14. Efectúa las siguientes operaciones:

- $3\sqrt{2} + 5\sqrt{2} - 7\sqrt{2} + 4\sqrt{2} =$
- $6\sqrt{2} - 2\sqrt{2} + 4\sqrt{2} - 5\sqrt{2} =$
- $3\sqrt{2} - 4\sqrt{8} + 5\sqrt{50} - 3\sqrt{32} =$
- $2\sqrt{20} + 4\sqrt{80} - 5\sqrt{180} + 3\sqrt{125} =$
- $\frac{2}{5}\sqrt{20} - \frac{3}{5}\sqrt{80} + \frac{1}{2}\sqrt{180} + 6\sqrt{45} =$
- $5\sqrt{44} - 3\sqrt{275} + 6\sqrt{396} - \sqrt{1331} =$
- $2\sqrt{3} - 3\sqrt{3} + 5\sqrt{3} - 4\sqrt{3} =$
- $2\sqrt{5} + 7\sqrt{5} - 3\sqrt{5} + 8\sqrt{5} =$
- $4\sqrt{12} - 3\sqrt{75} + 6\sqrt{300} - \sqrt{108} =$
- $\frac{1}{4}\sqrt{128} + 6\sqrt{512} - \frac{1}{2}\sqrt{32} - 3\sqrt{98} =$
- $\frac{4}{3}\sqrt{27} - \frac{1}{3}\sqrt{243} + \sqrt{75} - 2\sqrt{48} =$
- $7\sqrt{28} - 4\sqrt{63} + 5\sqrt{343} - 2\sqrt{7} =$

- $5\sqrt{\frac{9}{2}} - 3\sqrt{8} + 4\sqrt{\frac{25}{2}} - 2\sqrt{\frac{1}{2}} =$
- $7\sqrt{\frac{4}{3}} - 5\sqrt{3} + 2\sqrt{\frac{16}{3}} - \sqrt{27} =$
- $3\sqrt{\frac{1}{5}} + 7\sqrt{\frac{4}{5}} - 2\sqrt{5} + \sqrt{20} =$
- $3\sqrt{6} - 4\sqrt{\frac{25}{6}} + 3\sqrt{\frac{27}{2}} + \sqrt{\frac{32}{3}} =$
- $7\sqrt{\frac{32}{5}} - 2\sqrt{10} + \frac{1}{4}\sqrt{40} =$
- $2\sqrt{3} - 3\sqrt{27} + 4\sqrt{48} - 5\sqrt{300} + 9\sqrt{972} =$
- $2\sqrt{45} - 3\sqrt{80} + 4\sqrt{125} - \sqrt{500} + 2\sqrt{180} =$
- $3\sqrt{99} - 4\sqrt{44} + 5\sqrt{1331} - 2\sqrt{1100} + 3\sqrt{539} =$

15. Efectúa las siguientes operaciones:

- $2\sqrt{8} - 3\sqrt{72} + 5\sqrt{200} - 4\sqrt{722} + 5\sqrt{\frac{2}{25}} =$
- $7\sqrt{40} - 5\sqrt{90} + 6\sqrt{1000} - 3\sqrt{6250} + 20\sqrt{\frac{5}{2}} =$
- $\frac{1}{2}\sqrt{500} + \frac{1}{4}\sqrt{80} - 3\sqrt{320} + 6\sqrt{245} =$
- $3\sqrt{\frac{20}{3}} + 2\sqrt{60} + 3\sqrt{\frac{500}{3}} - 5\sqrt{15} =$
- $2\sqrt{6} - 3\sqrt{\frac{50}{3}} + 3\sqrt{\frac{200}{3}} + 3\sqrt{24} =$
- $3\sqrt{8} - 5\sqrt{\frac{81}{2}} + 16\sqrt{\frac{1}{8}} - 5\sqrt{\frac{25}{8}} =$

16. Efectúa las siguientes operaciones:

- $9\sqrt{2} \cdot 3\sqrt{8} =$
- $4\sqrt{\frac{1}{3}} \cdot 7\sqrt{3} =$
- $3\sqrt{\frac{1}{2}} \cdot 5\sqrt{32} =$
- $5\sqrt{3} \cdot 2\sqrt{75} =$
- $9\sqrt{6} \cdot 3\sqrt{\frac{25}{6}} =$
- $4\sqrt{\frac{1}{72}} \cdot 2\sqrt{18} =$
- $9\sqrt{\frac{1}{5}} \cdot 3\sqrt{80} =$
- $2\sqrt{\frac{3}{8}} \cdot 5\sqrt{96} =$
- $\frac{6\sqrt{32} \cdot 5\sqrt{8}}{12} =$
- $\frac{1}{2}\sqrt{\frac{1}{6}} \cdot 8\sqrt{54} =$
- $16\sqrt{\frac{2}{7}} \cdot \frac{1}{4}\sqrt{\frac{7}{8}} =$
- $\frac{2\sqrt{5} \cdot 3\sqrt{25} \cdot \sqrt{3}}{5\sqrt{15}} =$
- $15\sqrt{32} : 3\sqrt{2} =$
- $54\sqrt{18} : 9\sqrt{\frac{1}{2}} =$
- $7\sqrt{22} : \frac{1}{28}\sqrt{0,72} =$
- $48\sqrt{6} : 3\sqrt{\frac{3}{2}} =$
- $4\sqrt{48} : 2\sqrt{\frac{1}{3}} =$
- $4\sqrt{96} : \frac{1}{12}\sqrt{\frac{3}{8}} =$

• $(2 + \sqrt{3})^2 =$	• $(2 - \sqrt{3})^2 =$	• $(1 + 2\sqrt{3})^2 =$
• $(\sqrt{5} + 2\sqrt{2})^2 =$	• $(\sqrt{3} + \sqrt{2})^3 =$	• $(\sqrt{3} - \sqrt{2})^3 =$
• $(2\sqrt{3} + 2)^3 =$	• $(2\sqrt{3} - 2)^3 =$	• $(2\sqrt{2} - 3\sqrt{3})^3 =$
• $(2\sqrt{5} - 3\sqrt{2})^3 =$	• $\frac{5\sqrt{2} \cdot 3\sqrt{8}}{10} =$	• $\frac{3\sqrt{6} \cdot 25\sqrt{150}}{45} =$

17. Calcula:

• $(3 - 2\sqrt{2})(2\sqrt{2} - 3) =$	• $(2 - \sqrt{3})(2\sqrt{3} - 2) =$
• $(5 - \sqrt{2})(2 - \sqrt{5}) =$	

18. Efectúa las siguientes operaciones:

• $\sqrt{2}(\sqrt{32} - \sqrt{50} + \sqrt{18})$	• $\sqrt{3}(\sqrt{108} - \sqrt{27} + \sqrt{48})$
• $(\sqrt{5} - \sqrt{3})(6\sqrt{5} + 6\sqrt{3})$	• $(6\sqrt{6} - 6\sqrt{3})(\sqrt{6} + \sqrt{3})$
• $(4\sqrt{6} - 4\sqrt{3})(\sqrt{6} + \sqrt{3})$	• $(\sqrt{180} + \sqrt{162}) \cdot (\sqrt{20} - \sqrt{18})$
• $8\left(\sqrt{\frac{25}{2}} + \sqrt{\frac{9}{8}}\right)\left(\sqrt{32} - 3\sqrt{\frac{1}{2}}\right)$	

19. Efectúa las siguientes operaciones:

• $2\sqrt[3]{16} + 3\sqrt[3]{54} - \sqrt[3]{128} + \sqrt[3]{250}$	• $2\sqrt[4]{4375} - \sqrt[4]{9072} - 3\sqrt[4]{567} + \sqrt[4]{112}$
• $5\sqrt[4]{176} - 3\sqrt[4]{891} + 6\sqrt[4]{6875} - 2\sqrt[4]{14256}$	
• $2\sqrt[3]{1029} - 5\sqrt[3]{192} + 3\sqrt[3]{648}$	