



Prof
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Mathématiques

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القوى في مجموعة الأعداد الحقيقية

$$a^0 = 1$$

$$a^1 = a$$

$$\sqrt{a^2} = a$$

$$\sqrt{a^2} = |a|$$

تطبيق: احسب الأعداد التالية:

$$\sqrt{2^5}, \sqrt{2^4}, \sqrt{2^3}, \sqrt{2^2}$$

$$\sqrt{2^2} = 2; \sqrt{2^3} = \sqrt{2^2} \times \sqrt{2} = 2\sqrt{2}$$

$$\sqrt{2^4} = \sqrt{2^2} \times \sqrt{2^2} = 2 \times 2 = 4$$

$$\sqrt{2^5} = \sqrt{2^4} \times \sqrt{2^1} = 4\sqrt{2}$$

$$\sqrt{3^5}, \sqrt{3^4}, \sqrt{3^3}, \sqrt{3^2}$$

$$\sqrt{3^4} = 3^2 = 9; \sqrt{3^3} = 3\sqrt{3}; \sqrt{3^2} = 3$$

$$\sqrt{3^5} = \sqrt{3^4} \times \sqrt{3^1} = 3^2 \times \sqrt{3} = 9\sqrt{3}$$

$$\sqrt{5^5}, \sqrt{5^4}, \sqrt{5^3}, \sqrt{5^2}$$

$$\sqrt{5^4} = 5^2 = 25; \sqrt{5^3} = 5\sqrt{5}; \sqrt{5^2} = 5$$

$$\sqrt{5^5} = 25\sqrt{5}$$

$$\sqrt{5^{20}} = 5^{10}; \sqrt{5^{2024}} = 5^{1012}$$

$$\sqrt{5^{2023}} = \sqrt{5^{2022}} \times \sqrt{5}$$

$$= 5^{1011} \times \sqrt{5}$$

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$$a^n = a^n \rightarrow \begin{cases} a \in \mathbb{R} \\ n = 2k; k \in \mathbb{N} \end{cases} \text{ زوجي}$$

$$2^2 = 2 \times 2 = 4; (-2)^2 = (-2) \times (-2) = 4$$

$$(-a)^n = -a^n \quad (n: \text{فردية})$$

$$(-2)^3 = (-2) \times (-2) \times (-2) = -8$$

$$(-a)^n = a^n : n: \text{زوجي}$$

$$(-a)^n = -a^n : n: \text{فردية}$$

تطبيق:

(1) احسب:

$$(-\sqrt{2})^5, (-\sqrt{3})^3, (-\sqrt{5})^4, (-\sqrt{3})^2$$

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

$$(-\sqrt{5})^4 = \sqrt{5}^4 = 5^2 = 25$$

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

$$(-\sqrt{2})^5 = -\sqrt{2}^5 = -4\sqrt{2}$$

(2) احسب العمليات التالية:

$$B = 7 + 3 \times (-\sqrt{2})^4$$

$$= 7 + 3 \times \sqrt{2}^4$$

$$= 7 + 3 \times 4$$

$$B = 19$$

$$A = \sqrt{5}^2 + (-\sqrt{7})^2$$

$$= \sqrt{5}^2 + \sqrt{7}^2$$

$$= 5 + 7$$

$$A = 12$$





$$D = 4\sqrt{3} + (-\sqrt{3})^3 \times 5$$

$$4\sqrt{3} - \sqrt{3}^3 \times 5$$

$$= 4\sqrt{3} - 3\sqrt{3} \times 5$$

$$= 4\sqrt{3} - 15\sqrt{3}$$

$$D = -11\sqrt{3}$$

$$C = 2 \times (-\sqrt{3})^2 + 5$$

$$= 2\sqrt{3}^2 + 5$$

$$= 2 \times 3 + 5$$

$$= 6 + 5$$

$$C = 11$$

$$(a \times b)^n = a^n \times b^n$$

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n} ; (b \neq 0)$$

تطبيق:

(1) احسب العبارات التالية:

$$\left(\frac{\sqrt{5}}{3}\right)^3, (2\sqrt{3})^3, \left(\frac{\sqrt{7}}{5}\right)^2, (3\sqrt{5})^2$$

$$(3\sqrt{5})^2 = 3^2 \times \sqrt{5}^2 = 9 \times 5 = 45$$

$$(2\sqrt{3})^3 = 2^3 \times \sqrt{3}^3$$

$$\left(\frac{\sqrt{7}}{5}\right)^2 = \frac{\sqrt{7}^2}{5^2} = \frac{7}{25}$$

$$= 8 \times 3\sqrt{3}$$

$$= 24\sqrt{3}$$

$$\left(\frac{\sqrt{5}}{3}\right)^3 = \frac{\sqrt{5}^3}{3^3} = \frac{5\sqrt{5}}{27}$$

(2) احسب العمليات التالية:

$$\sqrt{7} - 8 \times \left(-\frac{\sqrt{7}}{2}\right)^3$$

$$\sqrt{7} + 8 \times \left(\frac{\sqrt{7}}{2}\right)^3$$

$$\sqrt{7} + 8 \times \frac{7\sqrt{7}}{8}$$

$$= \sqrt{7} + 7\sqrt{7}$$

$$= 8\sqrt{7}$$

$$\left(-\frac{\sqrt{5}}{3}\right)^2 \times 6 + 1$$

$$\left(\frac{\sqrt{5}}{3}\right)^2 \times 6 + 1$$

$$\frac{5}{9} \times 6 + 1$$

$$= \frac{10}{3} + \frac{3}{3}$$

$$= \frac{13}{3}$$

$$\sqrt{5} - (-3\sqrt{5})^3$$

$$= \sqrt{5} + (3\sqrt{5})^3$$

$$= \sqrt{5} + 27 \times 5\sqrt{5}$$

$$= 136\sqrt{5}$$

$$1 + (-5\sqrt{2})^2$$

$$= 1 + (5\sqrt{2})^2$$

$$= 1 + 25 \times 2$$

$$= 51$$

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تمرين منزلي: احسب العمليات التالية:

$$\begin{aligned} & -5\sqrt{2} - (-\sqrt{2})^3 \times \frac{11}{2} \\ & = -5\sqrt{2} + \cancel{2\sqrt{2}} \times \frac{11}{\cancel{2}} \\ & = -5\sqrt{2} + 11\sqrt{2} \\ & = 6\sqrt{2} \end{aligned}$$

$$\begin{aligned} & 1 + (-3\sqrt{2})^2 \times \frac{5}{6} \\ & = 1 + (3\sqrt{2})^2 \times \frac{5}{6} \\ & = 1 + 18 \times \frac{5}{6} \\ & = 16 \end{aligned}$$

$$\begin{aligned} & (-2\sqrt{5})^3 + 27\sqrt{5} \times \left(-\frac{1}{3}\right)^2 \\ & = -(2\sqrt{5})^3 + 27\sqrt{5} \times \frac{1}{9} \\ & = -8 \times 5\sqrt{5} + \cancel{9} \times 3\sqrt{5} \times \frac{1}{\cancel{9}} \\ & = -40\sqrt{5} + 3\sqrt{5} \\ & = -37\sqrt{5} \end{aligned}$$

$$\begin{aligned} & \frac{1}{2} - 5\sqrt{7} \times \left(-\frac{2}{\sqrt{7}}\right)^3 \\ & = \frac{1}{2} + \cancel{5\sqrt{7}} \times \frac{8}{\cancel{7\sqrt{7}}} \\ & = \frac{1}{2} + \frac{40}{7} \\ & = \frac{7+80}{14} \Rightarrow \frac{87}{14} \end{aligned}$$

$$\begin{aligned} & \left(\frac{\frac{\sqrt{3}}{7}}{-\frac{2}{\sqrt{3}}}\right)^2 + (-1)^9 = \frac{\left(\frac{\sqrt{3}}{7}\right)^2}{\left(+\frac{2}{\sqrt{3}}\right)^2} - 1 = \frac{\frac{3}{49}}{\frac{4}{3}} - 1 \\ & = \frac{3}{49} \times \frac{3}{4} - 1 = \frac{9}{196} - \frac{196}{196} \\ & = -\frac{185}{196} \end{aligned}$$





$$a^{-n} = \frac{1}{a^n}$$

تطبيق:

(1) احسب الأعداد التالية:

$$\sqrt{3}^{-3}, \sqrt{2}^{-4}, \sqrt{7}^{-2}, \sqrt{5}^{-4}, \sqrt{3}^{-2}$$

$$\sqrt{2}^{-2} = \frac{1}{\sqrt{2}^2} = \frac{1}{2} \quad \left| \quad \sqrt{5}^{-4} = \frac{1}{\sqrt{5}^4} = \frac{1}{625} \quad \left| \quad \sqrt{3}^{-2} = \frac{1}{\sqrt{3}^2} = \frac{1}{3}$$

$$\sqrt{2}^{-4} = \frac{1}{\sqrt{2}^4} = \frac{1}{4} \quad \left| \quad \sqrt{3}^{-3} = \frac{1}{\sqrt{3}^3} = \frac{1 \times \sqrt{3}}{3\sqrt{3} \times \sqrt{3}} = \frac{\sqrt{3}}{9}$$

$$(-\sqrt{3})^{-3} = -\frac{1}{\sqrt{3}^3} = -\frac{1}{3\sqrt{3}} = -\frac{\sqrt{3}}{9}$$

(2) احسب العمليات التالية:

$$\frac{\sqrt{7}^{-2}}{\sqrt{5}^{-3}}, \sqrt{3}^{-2} \times \sqrt{2}^{-4}, \sqrt{2}^{-2} + \sqrt{5}^{-2}$$

$$\frac{\frac{1}{7}}{\frac{1}{5\sqrt{5}}} = \frac{1}{7} \times 5\sqrt{5} = \frac{5\sqrt{5}}{7}$$

$$= \frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$$

$$= \frac{1}{2} + \frac{1}{5} = \frac{5+2}{10} = \frac{7}{10}$$

$$20 - 14 \times \sqrt{7}^{-2}, 6 \times \sqrt{3}^{-2} - 4$$

$$20 - 14 \times \frac{1}{7}$$

$$20 - 2 = 18$$

$$= 6 \times \frac{1}{3} - 4$$

$$= 2 - 4 = -2$$





$$a^{-n} = \frac{1}{a^n} \quad \left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

نشاط:

$$\left(\frac{a}{b}\right)^{-n} = \frac{b^n}{a^n}$$

قاعدة: إذا كان a و b عددين حقيقيين مخالفان للصفر و n عدد صحيح طبيعي فإن $\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$

$$\left(\frac{a}{b}\right)^{-n} = \frac{a^{-n}}{b^{-n}} = \frac{\frac{1}{a^n}}{\frac{1}{b^n}} = \frac{1}{a^n} \times \frac{b^n}{1} = \frac{b^n}{a^n} = \left(\frac{b}{a}\right)^n$$

$$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$$

تطبيق: احسب الأعداد التالية:

$$\left(\frac{3}{\sqrt{2}}\right)^{-3}, \quad \left(\frac{2}{\sqrt{7}}\right)^{-4}, \quad \left(\frac{\sqrt{5}}{3}\right)^{-2}$$

$$\left(\frac{\sqrt{2}}{3}\right)^3 = \frac{\sqrt{2}^3}{3^3} = \frac{2\sqrt{2}}{27}$$

$$\left(\frac{2}{\sqrt{7}}\right)^4 = \left(\frac{\sqrt{7}}{2}\right)^4 = \frac{\sqrt{7}^4}{2^4} = \frac{49}{16}$$

$$\left(\frac{3}{\sqrt{5}}\right)^2 = \frac{9}{5}$$

$$\left(\frac{-\frac{\sqrt{5}}{3}}{\frac{2}{\sqrt{5}}}\right)^{-2}$$

$$7 \times \left(-\frac{\sqrt{7}}{5}\right)^{-1} - \sqrt{7}^{-3}$$

$$5^{-1} + \left(-\frac{1}{\sqrt{3}}\right)^{-2}$$

$$\left(\frac{\frac{2}{\sqrt{5}}}{-\frac{\sqrt{5}}{3}}\right)^2 = \left(\frac{\frac{2}{\sqrt{5}}}{\left(\frac{\sqrt{5}}{3}\right)^2}\right)^2 = \frac{1}{5} \times \frac{9}{5} = \frac{36}{25}$$

$$7 \times \left(-\frac{5}{\sqrt{7}}\right) - \frac{1}{\sqrt{7}^3} = \frac{-35\sqrt{7}}{\sqrt{7} \times \sqrt{7}} - \frac{1 \times \sqrt{7}}{7\sqrt{7} \times \sqrt{7}} = \frac{-35\sqrt{7} \times 7}{7 \times 7} - \frac{\sqrt{7}}{49} = \frac{-246\sqrt{7}}{49}$$

$$= \frac{1}{5} + (-\sqrt{3})^2 = \frac{1}{5} + 3 = \frac{1}{5} + \frac{15}{5} = \frac{16}{5}$$

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ين منزلي: احسب العمليات التالية:

$$\left(\frac{-3}{\frac{\sqrt{3}}{5}}\right)^{-2}$$

$$6 \times 2^{-3} - \sqrt{5}^{-2}$$

$$4\sqrt{6} \times \sqrt{3}^{-1} - \sqrt{2}^3$$

$$\left(-\frac{3}{\sqrt{5}}\right)^{-2} + \left(-\frac{1}{2}\right)^{-1}$$

$$7^{-1} + \frac{8}{5} \times (-\sqrt{2})^{-4}$$

$$\begin{aligned} B &= 6 \times 2^{-3} - \sqrt{5}^{-2} \\ &= 6 \times \frac{1}{2^3} - \frac{1}{5} \\ &= \frac{3}{4} - \frac{1}{5} \end{aligned}$$

$$= \frac{11}{20}$$

$$\begin{aligned} A &= 4\sqrt{6} \times \sqrt{3}^{-1} - \sqrt{2}^3 \\ &= 4\sqrt{6} \times \frac{1}{\sqrt{3}} - 2\sqrt{2} \\ &= 4\sqrt{3} \times \sqrt{2} \times \frac{1}{\sqrt{3}} - 2\sqrt{2} \end{aligned}$$

$$A = 2\sqrt{2}$$

$$\left(-\frac{3}{\sqrt{5}}\right)^{-2} + \left(-\frac{1}{2}\right)^{-1}$$

$$7^{-1} + \frac{8}{5} \times (-\sqrt{2})^{-4}$$

$$\begin{aligned} C &= \left(\frac{\sqrt{5}}{3}\right)^2 - 2 \\ &= \frac{5}{9} - \frac{18}{9} \end{aligned}$$

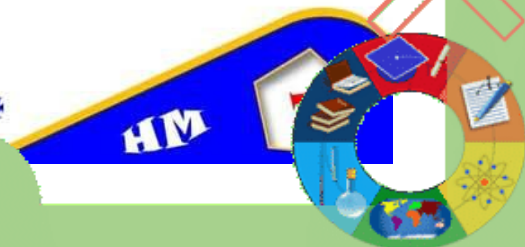
$$= -\frac{13}{9}$$

$$\begin{aligned} D &= \frac{1}{7} + \frac{8}{5} \times \frac{1}{4} \\ &= \frac{1}{7} + \frac{2}{5} \end{aligned}$$

$$= \frac{19}{35}$$

$$\left(\frac{-3}{\frac{\sqrt{3}}{5}}\right)^{-2}$$

$$= \left(\frac{\frac{\sqrt{3}}{5}}{3}\right)^2 = \frac{3}{25} \times \frac{1}{3 \times 3} = \frac{1}{75}$$





$$\sqrt{a^n} = \sqrt{a \times \dots \times a} = \sqrt{a} \times \dots \times \sqrt{a} = \sqrt{a}^n$$

العدد 1 $\sqrt{2}^{2021} + \sqrt{2}^{2021} + \sqrt{2}^{2021} + \sqrt{2}^{2021}$ يساوي $(4\sqrt{2})^{2021}$ $\sqrt{2}^{8084}$

العدد 2 $\sqrt{2^{4040}} + \sqrt{2^{4040}} + \sqrt{2^{4040}} + \sqrt{2^{4040}}$ يساوي $(4\sqrt{2})^{2022}$ $\sqrt{4 \times 2^{4040}}$

$\sqrt{2}^{2025}$ 2^{2022}

$$\begin{aligned} \sqrt{2}^{2021} + \sqrt{2}^{2021} + \sqrt{2}^{2021} + \sqrt{2}^{2021} &= 4 \times \sqrt{2}^{2021} \\ &= 2^2 \times \sqrt{2}^{2021} \\ &= \sqrt{2^4} \times \sqrt{2}^{2021} \\ &= \sqrt{2^{2025}} \end{aligned}$$

$$\begin{aligned} \sqrt{2^{4040}} + \sqrt{2^{4040}} + \sqrt{2^{4040}} + \sqrt{2^{4040}} &= 4 \times \sqrt{2^{4040}} \\ &= \sqrt{2^4 \times 2^{4040}} = \sqrt{2^{4044}} = \sqrt{(2^{2022})^2} \quad \sqrt{a^2} = |a| \\ &= |2^{2022}| = 2^{2022} \end{aligned}$$

$$\sqrt{a^n} = \sqrt{a}^n ; a \in \mathbb{R}_+ ; n \in \mathbb{Z}$$

تطبيق: احسب الأعداد التالية:

$$\sqrt{5^{-3}}, \sqrt{7^{-2}}, \sqrt{3^4}, \sqrt{5^3}, \sqrt{2^3}$$

$$\begin{array}{|l} \sqrt{3^4} = \sqrt{3}^4 = 9 \\ \sqrt{5^{-3}} = \sqrt{5}^{-3} \\ = \frac{1}{5\sqrt{5}} = \frac{\sqrt{5}}{25} \end{array} \quad \begin{array}{|l} \sqrt{5^3} = \sqrt{5}^3 = 5\sqrt{5} \\ \sqrt{7^{-2}} = \sqrt{7}^{-2} = \frac{1}{7} \end{array} \quad \begin{array}{|l} \sqrt{2^3} = \sqrt{2}^3 = 2\sqrt{2} \end{array}$$





$$a^n \times a^m = a^{n+m}$$

أحسب

تطبيق: اكتب في صيغة قوة:

$$(-\sqrt{7})^5 \times (-\sqrt{7})^3 = (-\sqrt{7})^8 = \sqrt{7}^8$$

$$7^4$$

$$\begin{aligned} \sqrt{3}^{-8} \times \sqrt{3}^{-6} &= \sqrt{3}^{-14} \\ &= \frac{1}{\sqrt{3}^{14}} \\ &= \frac{1}{3^7} = \left(\frac{1}{3}\right)^7 \end{aligned}$$

$$\begin{aligned} \sqrt{2}^7 \times \sqrt{2}^{-11} &= \sqrt{2}^{-4} \\ &= \frac{1}{\sqrt{2}^4} = \left(\frac{1}{\sqrt{2}}\right)^4 \\ &= \frac{1}{4} \end{aligned}$$

$$\begin{aligned} \sqrt{2}^5 \times \sqrt{2}^4 &= \sqrt{2}^{5+4} \\ &= \sqrt{2}^9 \\ &= \sqrt{2}^8 \times \sqrt{2} \\ &= 16\sqrt{2} \end{aligned}$$

$$\frac{1}{3} \times \sqrt{3}^{19}$$

$$\begin{aligned} &= \sqrt{3}^{-2} \times \sqrt{3}^{19} \\ &= \sqrt{3}^{17} \end{aligned}$$

$$2\sqrt{2} \times \sqrt{2}^{11}$$

$$\begin{aligned} &= \sqrt{2}^3 \times \sqrt{2}^{11} \\ &= \sqrt{2}^{14} \end{aligned}$$

$$9 \times \sqrt{3}^{14}$$

$$\begin{aligned} &= \sqrt{3}^4 \times \sqrt{3}^{14} \\ &= \sqrt{3}^{18} \end{aligned}$$

$$5 \times \sqrt{5}^{17}$$

$$\begin{aligned} &= \sqrt{5}^2 \times \sqrt{5}^{17} \\ &= \sqrt{5}^{19} \end{aligned}$$

تطبيق 2:

$$\begin{aligned} a &= (-\sqrt{3})^4 \times \sqrt{3}^5 \\ &= \sqrt{3}^4 \times \sqrt{3}^5 \\ a &= \sqrt{3}^9 \end{aligned} \quad (1)$$

$$\begin{aligned} a &= (-\sqrt{3})^4 \times \sqrt{3}^5 \\ b &= \left(\frac{\sqrt{3}}{2}\right)^{15} \times \left(\frac{2}{\sqrt{3}}\right)^7 \end{aligned}$$

$$\begin{aligned} b &= \left(\frac{\sqrt{3}}{2}\right)^{15} \times \left(\frac{2}{\sqrt{3}}\right)^7 \\ &= \left(\frac{\sqrt{3}}{2}\right)^{15} \times \left(\frac{\sqrt{3}}{2}\right)^{-7} \\ b &= \left(\frac{\sqrt{3}}{2}\right)^8 \end{aligned}$$

$$b = \left(\frac{\sqrt{3}}{2}\right)^8 \text{ و } a = \sqrt{3}^9 \quad (1)$$

$$c = -\sqrt{7}^5 \times \sqrt{7}^6 \quad (2) \quad \text{اكتب في صيغة قوة } c.$$

$$\begin{aligned} c &= -\sqrt{7}^5 \times \sqrt{7}^6 \\ &= (-\sqrt{7})^5 \times (-\sqrt{7})^6 \\ c &= (-\sqrt{7})^{11} \end{aligned} \quad (3)$$





$$a^n \times b^n = (a.b)^n$$

تطبيق:

(1) اكتب في صيغة قوة:

$$\left(\frac{3}{\sqrt{7}}\right)^{-19} \times \left(\frac{7}{6}\right)^{-19}, \quad \sqrt{2}^{-13} \times \sqrt{6}^{-13}, \quad (-\sqrt{5})^{11} \times (-2\sqrt{5})^{11}, \quad \sqrt{2}^9 \times \sqrt{3}^9$$

$$\left(\frac{3}{\sqrt{7}} \times \frac{\sqrt{7} \times \sqrt{7}}{3 \times 2}\right)^{-19} = (\sqrt{2} \times \sqrt{6})^{-13} = (-\sqrt{5} \times (-2\sqrt{5}))^{11} = (\sqrt{2} \times \sqrt{3})^9$$

$$\left(\frac{2}{\sqrt{7}}\right)^{19} = \frac{1}{\sqrt{12}^{13}} = 10^{11} = \sqrt{6}^9$$

$$\left(\frac{2\sqrt{7}}{7}\right)^{19} = \left(\frac{1}{\sqrt{12}}\right)^{13} = \left(\frac{\sqrt{12}}{12}\right)^{13}$$

(2) $a = 3^{17} \times \sqrt{5}^{17}$ ، $a = \sqrt{15}^{17} \times \sqrt{3}^{17}$ ، بين أن

$$a = \sqrt{15}^{17} \times \sqrt{3}^{17}$$

$$= \sqrt{5}^{17} \times \sqrt{3}^{17} \times \sqrt{3}^{17}$$

$$= (\sqrt{3} \times \sqrt{3})^{17} \times \sqrt{5}^{17}$$

$$a = 3^{17} \times \sqrt{5}^{17}$$

تمرين منزلي:

$$E = 4a^3 \times 2b^{-12} \times \frac{a^4 b}{8}$$

$$= a^3 \times a \times b^{-12} \times b$$

$$E = a^4 \times b^{-11}$$

$$E = 4a^3 \times 2b^{-12} \times \frac{ab}{8}$$

(1) بين أن $E = a^4 b^{-11}$





$$E = a^4 \times b^{-11}$$

(2) احسب E في كل حالة:

$$.b = 10, a = 20^*$$

$$E = 20^4 \times 10^{-11}$$

$$= 2^4 \times 10^4 \times \frac{1}{10^4 \times 10^7}$$

$$= 2^4 \times \frac{1}{10^7}$$

$$= 2^4 \times \frac{1}{2^4 \times 5^7}$$

$$= \frac{1}{2^3 \times 5^7}$$

$$.b = \frac{\sqrt{3}}{5}, a = \frac{5}{\sqrt{3}}^*$$

$$E = \left(\frac{5}{\sqrt{3}}\right)^4 \times \left(\frac{\sqrt{3}}{5}\right)^{-11}$$

$$= \left(\frac{5}{\sqrt{3}} \times \frac{5}{\sqrt{3}}\right)^{15}$$

$$= \left(\frac{25}{3}\right)^{15}$$

$$.b = \sqrt{5} \text{ و } a = -\sqrt{5}^*$$

$$E = (-\sqrt{5})^4 \times (\sqrt{5})^{-11}$$

$$= 5^2 \times \frac{1}{5^5 \sqrt{5}}$$

$$= 5^2 \times \frac{1}{5^2 \times 5^3 \sqrt{5}}$$

$$= \frac{1 \times \sqrt{5}}{125 \times 5}$$

$$= \frac{\sqrt{5}}{625}$$

(3) اختصر E إذا علمت أن a و b^{-1} مقلوبان.

$$a \times b^{-1} = 1$$

$$\frac{a}{b} = 1$$

a و b^{-1} مقلوبان يعني

$$E = a^4 \times b^{-11} = a^4 \times b^{-4} \times b^{-7}$$

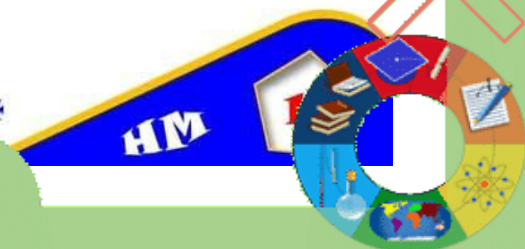
$$= a^4 \times \frac{1}{b^4} \times b^{-7}$$

$$= \left(\frac{a}{b}\right)^4 \times b^{-7}$$

$$= 1^4 \times b^{-7}$$

$$= b^{-7} = \frac{1}{b^7}$$

$$E = b^{-7}$$





$$(a^n)^m = a^{n \times m} ; a \in \mathbb{R}^*$$

تطبيق: اكتب في صيغة قوة:

$$(\sqrt{5}^{-4})^3 \times (\sqrt{5}^2)^{-6} , ((-\sqrt{3})^{-6})^{-5} , (\sqrt{5}^3)^{-4}$$

$$\begin{aligned} ((-\sqrt{3})^{-6})^{-5} &= (+\sqrt{3})^{30} \\ &= \sqrt{3}^{30} \\ &= 3^{15} \end{aligned}$$

$$\begin{aligned} (\sqrt{5}^3)^{-4} &= \sqrt{5}^{-12} \\ &= 5^{-6} \\ &= \frac{1}{5^6} \\ &= \left(\frac{1}{5}\right)^6 \end{aligned}$$

$$\begin{aligned} (\sqrt{5}^{-4})^3 \times (\sqrt{5}^2)^{-6} &= \sqrt{5}^{-12} \times \sqrt{5}^{-12} \\ &= 5^{-12} \\ &= \left(\frac{1}{5}\right)^{12} \end{aligned}$$

$$\begin{aligned} \left(\frac{4}{3}\right)^5 \times \left(\frac{2}{\sqrt{3}}\right)^6 , (5\sqrt{5})^{-6} \times \sqrt{5}^{-23} , 3^4 \times \sqrt{3}^{17} , 2^3 \times \sqrt{2}^{11} \\ = \left(\frac{4}{3}\right)^5 \times \left[\left(\frac{2}{\sqrt{3}}\right)^2\right]^3 &= (\sqrt{5}^3)^{-6} \times \sqrt{5}^{-23} &= \sqrt{3}^8 \times \sqrt{3}^{14} &= \sqrt{2}^6 \times \sqrt{2}^{11} \\ = \left(\frac{4}{3}\right)^5 \times \left(\frac{4}{3}\right)^3 &= \sqrt{5}^{-18} \times \sqrt{5}^{-23} &= \sqrt{3}^{22} &= \sqrt{2}^{17} \\ = \left(\frac{4}{3}\right)^8 &= \sqrt{5}^{-41} &= \sqrt{5}^{41} &= \sqrt{2}^{17} \\ &= \left(\frac{1}{\sqrt{5}}\right)^{41} &= \left(\frac{\sqrt{5}}{5}\right)^{41} & \end{aligned}$$





تطبيق:

$$a = \frac{1}{9} \quad \text{بين أن} \quad a = 3^7 \times \left(\frac{1}{\sqrt{3}}\right)^{18} \quad (1)$$

$$a = 3^7 \times \frac{1}{3^9}$$

$$= 3^7 \times \frac{1}{3^7 \times 3^2}$$

$$a = \frac{1}{9}$$

$$a = 3^7 \times \left(\left(\frac{1}{\sqrt{3}}\right)^2\right)^9$$

$$= 3^7 \times \left(\frac{1}{3}\right)^9$$

$$= 3^7 \times 3^{-9}$$

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

$$b = 10^{-3} \quad \text{بين أن} \quad b = 1000^7 \times (0,01)^{12} \quad (2)$$

$$10^{-1} = 0,1$$

$$10^{-2} = 0,01$$

$$10^{-3} = 0,001$$

$$2,7 = 27 \times 10^{-1}$$

$$2,78 = 278 \times 10^{-2}$$

$$0,278 = 278 \times 10^{-3}$$

$$b = 1000^7 \times (0,01)^{12}$$

$$= (10^3)^7 \times (10^{-2})^{12}$$

$$= 10^{21} \times 10^{-24}$$

$$b = 10^{-3}$$





$$n \in \mathbb{Z} ; \frac{a^n}{b^n} = \left(\frac{a}{b}\right)^n ; a \in \mathbb{R}^+ ; b \in \mathbb{R}^+$$

تطبيق:

$$(1) \text{ اكتب في صيغة قوة: } \frac{\left(\frac{\sqrt{2}}{9}\right)^{15}}{\left(\frac{3}{\sqrt{2}}\right)^{15}}$$

$$\frac{\left(\frac{\sqrt{2}}{9}\right)^{15}}{\left(\frac{3}{\sqrt{2}}\right)^{15}} = \left(\frac{\frac{\sqrt{2}}{9}}{\frac{3}{\sqrt{2}}}\right)^{15} = \left(\frac{\sqrt{2}}{9} \times \frac{\sqrt{2}}{3}\right)^{15}$$

$$= \left(\frac{2}{27}\right)^{15}$$

$$(2) \text{ } a = \frac{7^6 \times 9^{12}}{\sqrt{7}^6 \times (3\sqrt{3})^{12}}, \text{ بين أن } a = (3\sqrt{7})^6$$

$$a = \frac{7^6 \times 9^{12}}{\sqrt{7}^6 \times (3\sqrt{3})^{12}} = \frac{\sqrt{7}^{12} \times 9^{12}}{\sqrt{7}^6 \times ((\sqrt{3})^3)^{12}}$$

$$= \frac{\sqrt{7}^{12} \times 9^{12}}{\sqrt{7}^6 \times ((\sqrt{3})^3)^{12}} = \frac{\cancel{\sqrt{7}^6} \times \sqrt{7}^6 \times (3^2)^{12}}{\cancel{\sqrt{7}^6} \times (\sqrt{3}^2)^{18}}$$

$$\frac{\sqrt{7}^6 \times 3^6 \times \cancel{3^{18}}}{\cancel{3^{18}}} = \sqrt{7}^6 \times 3^6$$

$$a = (3\sqrt{7})^6$$





$$a \in \mathbb{R}^+ \\ n, m \in \mathbb{Z} \quad \frac{a^n}{a^m} = a^n \times a^{-m} = a^{n-m}$$

تطبيق:

$$\frac{(-\sqrt{7})^{-4}}{(-\sqrt{7})^{12}}, \quad \frac{\sqrt{5}^{17}}{\sqrt{5}^{-8}} \quad (1) \text{ اكتب في صيغة قوة:}$$

$$\frac{(-\sqrt{7})^{-4}}{(-\sqrt{7})^{12}} = \frac{7^{-2}}{7^6} \quad \left| \quad \frac{\sqrt{5}^{17}}{\sqrt{5}^{-8}} = \sqrt{5}^{17+8} \right. \\ = 7^{-8} = \left(\frac{1}{7}\right)^8 \quad \left. \quad \quad \quad = \sqrt{5}^{25} \right.$$

$$14 \times \frac{\sqrt{7}^{-18}}{7^{-8}}, \quad \frac{\sqrt{2}^{19}}{\sqrt{3}^{27}} \times \frac{\sqrt{3}^{25}}{\sqrt{2}^{16}} \quad (2) \text{ احسب:}$$

$$= 14 \times \frac{7^{-8} \times 7^{-1}}{7^{-8}} \quad \left| \quad = \frac{\sqrt{2}^{16} \times \sqrt{2}^3 \times \sqrt{3}^{25}}{\sqrt{3}^{25} \times \sqrt{3}^2 \times \sqrt{2}^{16}} \right. \\ = \frac{14}{7} = 2 \quad \left. \quad \quad \quad = \frac{2\sqrt{2}}{3} \right.$$

$$a = 5 \times 10^{16} \text{ ، } a = \frac{3000^2 \times (0,1)^{-7}}{0,0018} \quad (3)$$

$$a = \frac{(3 \times 10^3)^2 \times (10^{-1})^{-7}}{18 \times 10^{-4}}$$





$$\frac{9 \times 10^6 \times 10^7}{9 \times 2} \times 10^4$$

$$= \frac{10 \times 10^{16}}{2}$$

$$a = 5 \times 10^{16}$$

تمرين منزلي: (+ 5 ص 60: c و d / 6 ص 60: a و d)

$$E = \frac{(2ab^{-2})^2 \times (a^3b)^5}{2(a^{-1}b^3)^{-3}}$$

(1) بين أن $E = 2a^{14}b^{10}$

$$E = \frac{(2ab^{-2})^2 \times (a^3b)^5}{2(a^{-1}b^3)^{-3}} = \frac{4a^2 \cdot b^{-4} \cdot a^{15} \cdot b^5}{2a^3 b^{-9}}$$

$$= 2a^{17} \cdot b \cdot a^{-3} \cdot b^9$$

$$= 2a^{14}b^{10}$$

إذن كان $E = 2a^{14}b^{10}$

(2) احسب E في الحالتين: * $a = \frac{3}{25}$ و $b = \frac{5}{\sqrt{3}}$ * $a = 0,01$ و $b = 10000$

$$E = 2 \times (10^{-2})^7 \times (10^4)^{14}$$

$$= 2 \times 10^{-14} \times 10^{56}$$

$$E = 2 \times 10^{42}$$

$$E = 2 \left(\frac{3}{25} \right)^7 \times \left(\frac{5}{\sqrt{3}} \right)^{14}$$

$$= 2 \underbrace{\left(\frac{3}{25} \right)^7 \times \left(\frac{25}{3} \right)^7}_1$$

$$E = 2$$





حمام الشط برج السدرية

- القوى في ١٨ -

القوى في ١٨

$$\underbrace{a \times \dots \times a}_m \text{ مرة} = a^m$$

تعريف: القوة هي امتداد لجداء متكونة من نفس العامل
إذا كان a عدد حقيقي و m عدد صحيح طبيعي فإن

ملحوظة: إذا كان a عدد حقيقي فإن

$$a^0 = 1 \quad a^1 = a$$

تطبيق:

احسب الأعداد التالية:

$$\begin{aligned} \sqrt{2}^2 &= 2, \sqrt{2}^3 = 2\sqrt{2}, \sqrt{2}^4 = 2^2 = 4, \sqrt{2}^5 = 2^2 \times \sqrt{2} = 2\sqrt{2}, \sqrt{3}^4 = 3^2 = 9, \sqrt{3}^5 = 3^2 \times \sqrt{3} = 3\sqrt{3} \\ \sqrt{3}^6 &= 3^3 = 27, \sqrt{3}^7 = 3^3 \times \sqrt{3} = 9\sqrt{3}, \sqrt{5}^4 = 5^2 = 25, \sqrt{5}^5 = 5^2 \times \sqrt{5} = 5\sqrt{5}, \sqrt{5}^6 = 5^3 = 125, \sqrt{5}^7 = 5^3 \times \sqrt{5} = 25\sqrt{5} \end{aligned}$$

ملحوظات:

القوة الزوجية لعدد حقيقي سالب هو عدد حقيقي موجب

إذا كان a عدد حقيقي فإن: $(-a)^m = a^m$ إذا كان m عدد زوجي

مثال: $(-5)^4 = 5^4$

القوة الفردية لعدد حقيقي سالب هو عدد حقيقي سالب

إذا كان a عدد حقيقي فإن: $(-a)^m = -a^m$ إذا كان m عدد فردي

يحيى الحاجي

تطبيق: احسب

$$\begin{aligned} (-\sqrt{3})^2 &= \sqrt{3}^2 = 3, (-\sqrt{3})^4 = \sqrt{3}^4 = 9, (-\sqrt{3})^6 = \sqrt{3}^6 = 27, (-\sqrt{3})^8 = \sqrt{3}^8 = 81 \\ (-\sqrt{2})^5 &= -\sqrt{2}^5 = -4\sqrt{2} \end{aligned}$$

احسب العمليات التالية:

$$\begin{aligned} A &= 2 \times (-\sqrt{3})^2 + 5 \\ &= 2 \times 3 + 5 \\ &= 11 \end{aligned}$$

$$\begin{aligned} B &= \sqrt{5} + (-\sqrt{5})^2 \\ &= 5 + 7 \\ B &= 12 \end{aligned}$$

$$\begin{aligned} C &= 4\sqrt{3} + (-\sqrt{3})^3 \times 5 \\ &= 4\sqrt{3} - \sqrt{3}^3 \times 5 \\ &= 4\sqrt{3} - 3\sqrt{3} \times 5 \\ &= 4\sqrt{3} - 15\sqrt{3} \end{aligned}$$

١١
١٢
١٥





إذا كان a و b عددا حقيقيين و m عدد صحيح طبيعي فإن:

$$(a \cdot b)^m = a^m \cdot b^m$$

$$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$$

إذا كان a و b عددا حقيقيين بحيث $b \neq 0$ مع الفارق:

نسطف: احسب العباراة التالية:

$$(3\sqrt{5})^2 = 9 \times 5 = 45 \quad (2\sqrt{3})^3 = 8 \times 3\sqrt{3} = 24\sqrt{3} \quad \left(\frac{\sqrt{7}}{5}\right)^2 = \frac{\sqrt{7}^2}{5^2} = \frac{7}{25}$$

$$\left(\frac{\sqrt{7}}{5}\right)^2 = \frac{3\sqrt{5}}{25} \cdot \frac{8\sqrt{3}}{9} = \frac{\sqrt{5}}{9} \quad \left(\frac{\sqrt{3}}{\sqrt{5}}\right) = \frac{\sqrt{3}^3}{\sqrt{5}^3} = \frac{3\sqrt{3} \cdot \sqrt{3}}{5\sqrt{5} \cdot \sqrt{5}} = \frac{3\sqrt{3} \cdot 3}{5 \cdot 5} = \frac{9\sqrt{3}}{25}$$

$$\left(\frac{2\sqrt{2}}{3\sqrt{6}}\right)^2 = \frac{2\sqrt{2}^2}{3\sqrt{6}^2} = \frac{28}{54} = \frac{14}{27}$$

التلميذ: يحيى الحاجي

اصنع تمرين منزلي 1

$$A = \sqrt{7} \cdot 8 \cdot \left(\frac{-\sqrt{7}}{8}\right)^3$$

$$= \sqrt{7} \cdot 8 \cdot \frac{(-\sqrt{7})^3}{8^3}$$

$$= \sqrt{7} \cdot 8 \cdot \frac{(-\sqrt{7})^3}{8}$$

$$= \sqrt{7} \cdot 7\sqrt{7}$$

$$A = 8\sqrt{7}$$

$$B = \left(\frac{-\sqrt{5}}{3}\right)^2 \cdot 6 + 1$$

$$= \left(\frac{-\sqrt{5}}{3}\right)^2 \cdot 6 + 1$$

$$= \frac{5}{9} \cdot 6 + 1$$

$$= \frac{5}{3} \cdot 2 + 1$$

$$= \frac{5}{3} \cdot 2 + 1$$

$$B = \frac{13}{3}$$

$$C = 1 + (-5\sqrt{2})^2$$

$$= 1 + 5^2 \cdot 2$$

$$= 1 + 25 \cdot 2$$

$$= 51$$

$$D = \sqrt{5} - (-3\sqrt{5})^3$$

$$= \sqrt{5} - 27 \cdot \sqrt{5}^3$$

$$= \sqrt{5} - 135\sqrt{5}$$

$$D = -136\sqrt{5}$$

الأستاذ: محمد الحبيب الغزلاني

اصنع تمرين منزلي 2

$$A = 5\sqrt{2} - (-\sqrt{2})^3 + \frac{11}{2}$$

$$= 5\sqrt{2} + 2\sqrt{2} + \frac{11}{2}$$

$$= 7\sqrt{2} + \frac{11}{2}$$

$$= 6\sqrt{2}$$

$$C = \frac{1}{2} - 5\sqrt{2} \cdot \left(\frac{2}{\sqrt{7}}\right)^3$$

$$= \frac{1}{2} - 5\sqrt{2} \cdot \left(\frac{8}{7\sqrt{7}}\right)$$

$$= \frac{7}{14} + \frac{80}{14}$$

$$C = \frac{87}{14}$$

$$B = 1 + (-3\sqrt{2})^2 + \frac{5}{6}$$

$$= 1 + 9 \cdot 2 + \frac{5}{6}$$

$$= 1 + 15$$

$$B = 16$$

$$B = (-2\sqrt{5})^3 + 27\sqrt{5} \cdot \left(-\frac{1}{9}\right)^2$$

$$= -8 \times 5\sqrt{5} + 27\sqrt{5} \cdot \frac{1}{9}$$

$$= -40\sqrt{5} + 3\sqrt{5}$$

$$D = -37\sqrt{5}$$

حمام الشط
برج السدرية





حمام الشط برج السدريّة

إذا كان عدد صحيح من الأسس وطبقتي

$$a^{-n} = \frac{1}{a^n}$$

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

مثال

ملاحظة: إذا كان عدد صحيح فإن:

$$a^{-1} = \frac{1}{a}$$

طريقة احسبه

$$\sqrt{3}^{-2} = \frac{1}{\sqrt{3}^2} = \frac{1}{3} \quad \sqrt{5}^{-4} = \frac{1}{\sqrt{5}^4} = \frac{1}{5^2} = \frac{1}{25} \quad \sqrt{7}^{-2} = \frac{1}{\sqrt{7}^2} = \frac{1}{7}$$

$$\sqrt{3}^{-3} = \frac{1}{\sqrt{3}^3} = \frac{1 \times \sqrt{3}}{3\sqrt{3} \times \sqrt{3}} = \frac{\sqrt{3}}{9} \quad \sqrt{5}^{-5} = \frac{1}{\sqrt{5}^5} = \frac{1 \times \sqrt{5}}{25\sqrt{5} \times \sqrt{5}} = \frac{\sqrt{5}}{125}$$

$$\sqrt{2}^{-7} = \frac{1}{\sqrt{2}^7} = \frac{1}{2^3}$$

التلميذ: يحيى الحاجي

طريقة احسب

$$A = \sqrt{2}^{-2} = \sqrt{5}^{-2} \quad B = \sqrt{3}^{-2} \times \sqrt{2}^{-4}$$

$$= \frac{1}{2} \times \frac{1}{5} \quad = \frac{1}{3} \times \frac{1}{4}$$

$$A = \frac{1}{10} \quad B = \frac{1}{12}$$

$$C = \frac{\sqrt{2}^{-2}}{\sqrt{5}^{-3}} = \frac{\frac{1}{2}}{\frac{1}{125}} = \frac{1}{2} \times \frac{125}{1}$$

$$C = \frac{125}{2}$$

$$D = 6 \times \sqrt{3}^{-2} - 4 = 6 \times \frac{1}{3} - 4 = 3 - 4$$

$$D = -1$$





$$\begin{aligned} E &= 20 - 14 \times \sqrt{7}^{-2} \\ &= 20 - 14 \times \frac{1}{7} \\ &= 20 - 2 \\ E &= 18 \end{aligned}$$

نستأنف

$$\left(\frac{a}{b}\right)^{-n} = \frac{b^n}{a^n}$$

$$\frac{a^{-n}}{b^{-n}} = \frac{\frac{1}{a^n}}{\frac{1}{b^n}} = \frac{1}{a^n} \times \frac{b^n}{1} = \frac{b^n}{a^n}$$

قاعدة

ان احدهما و b عددا حقيقيان فان

$$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$$

التلميذ: يحيى الحاجي

ملاحظة

ان احدهما و b عددا حقيقيان فان

$$\left(\frac{a}{b}\right)^{-1} = \frac{b}{a}$$

نطبق

$$\left(\frac{\sqrt{3}}{2}\right)^{-2} = \left(\frac{2}{\sqrt{3}}\right)^2 = \frac{4}{3}$$

$$\left(\frac{2}{\sqrt{5}}\right)^{-3} = \left(\frac{\sqrt{5}}{2}\right)^3 = \frac{5\sqrt{5}}{8}$$

$$\left(\frac{5}{\sqrt{2}}\right)^{-4} = \left(\frac{\sqrt{2}}{5}\right)^4 = \frac{4}{625}$$

$$5^{-1} + \left(\frac{1}{\sqrt{3}}\right)^{-2} = \frac{1}{5} + \left(\sqrt{3}\right)^2$$

$$= \frac{1}{5} + 3 = \frac{16}{5}$$

$$\begin{aligned} 7 \times \left(\frac{\sqrt{2}}{3}\right)^{-1} &= 7 \times \left(\frac{3}{\sqrt{2}}\right) = \frac{1}{\sqrt{2}^2} \\ \left(\frac{\sqrt{5}}{3}\right)^{-2} &= \left(\frac{3}{\sqrt{5}}\right)^2 = \frac{9}{5} \\ &= \frac{4}{5} \times \frac{9}{5} = \frac{36}{25} \end{aligned}$$

$$\begin{aligned} &= \frac{-7 \times 3\sqrt{2}}{7} = \frac{-21\sqrt{2}}{7} = -3\sqrt{2} \\ &= \frac{-16\sqrt{2} - \sqrt{2}}{49} = \frac{-17\sqrt{2}}{49} \end{aligned}$$





$$A = 4\sqrt{6} \times \sqrt{3}^{-1} - \sqrt{2}^3$$

$$= 4 \times \sqrt{3} \times \sqrt{2} - \frac{1}{\sqrt{3}} - 2\sqrt{2}$$

$$= 4\sqrt{2} - 2\sqrt{2}$$

$$A = 2\sqrt{2}$$

اصنع تمرين منزلي

$$B = 7^{-1} - \frac{8}{5} \times (-\sqrt{2})^{-4}$$

$$= \frac{1}{7} + \frac{8}{5} \times \frac{1}{2^2}$$

$$= \frac{1}{7} + \left(\frac{8}{5} \times \frac{1}{4}\right)$$

$$= \frac{1}{7} + \frac{2}{5}$$

$$= \frac{5}{35} + \frac{14}{35}$$

$$B = \frac{19}{35}$$

$$C = 6 \times 2^{-3} - \sqrt{5}^{-2}$$

$$= 6 \times \frac{1}{2^3} - \frac{1}{5}$$

$$= 6 \times \frac{1}{8} - \frac{1}{5}$$

$$= 3 \times \frac{1}{4} - \frac{1}{5}$$

$$= \frac{3}{4} - \frac{1}{5}$$

$$C = \frac{11}{20}$$

$$D = \left(\frac{-3}{\sqrt{5}}\right)^{-2} + \left(\frac{-1}{2}\right)^{-1}$$

$$= \left(\frac{\sqrt{5}}{3}\right)^2 + \left(\frac{-2}{1}\right)$$

$$= \frac{5}{3} - \frac{2}{1}$$

$$D = \frac{-13}{3}$$

التلميذ: يحيى الحاجي

$$E = \left(\frac{-3}{\sqrt{5}}\right)^{-2} = \left(\frac{\sqrt{5}}{3}\right)^2$$

$$= \frac{\left(\frac{\sqrt{5}}{3}\right)^2}{3^2}$$

$$= \frac{5}{25} = \frac{1}{5}$$

$$E = \frac{1}{5}$$



$$\sqrt[n]{a^m} = \sqrt[n]{a^m}$$

$$\sqrt[n]{a^m} = \sqrt[n]{a \times a \times \dots \times a} = \sqrt[n]{a} \times \sqrt[n]{a} \times \dots \times \sqrt[n]{a} = \sqrt[n]{a^m}$$

$$\sqrt[n]{a^m} = \sqrt[n]{a^m}$$

اذا كان عدد حقيقي موجب مخالف لـ 1

وهو عدد نسبي فإن

نطبق

احسب الاعداد التالية

$$\sqrt{2^3} = \sqrt{2^3} = 2\sqrt{2} \quad , \quad \sqrt{5^3} = \sqrt{5^3} = 5\sqrt{5} \quad , \quad \sqrt{3^4} = \sqrt{3^4} = 3^2 = 9$$

$$\sqrt{7^{-2}} = \sqrt{7^{-2}} = \frac{1}{\sqrt{7^2}} = \frac{1}{7} \quad , \quad \sqrt{5^{-3}} = \sqrt{5^{-3}} = \frac{1 \cdot \sqrt{5}}{5\sqrt{5} \cdot \sqrt{5}} = \frac{\sqrt{5}}{25}$$

خاصية 2

اذا كان عدد حقيقي و m و عدد حقيقي نسبي فإن

$$a^m \times a^n = a^{m+n}$$





نظيفة 1

الكتب في صيغة قوة

$$\sqrt{2}^4 \times \sqrt{2}^9 = \sqrt{2}^{4+9} = \sqrt{2}^{13} = 2^4 \times \sqrt{2} = 16\sqrt{2}$$

$$\sqrt{2}^7 \times \sqrt{2}^{-11} = \sqrt{2}^{7+(-11)} = \sqrt{2}^{-4}$$

$$5 \times \sqrt{5}^{12} = \sqrt{5}^{2+12} = \sqrt{5}^{14}$$

$$= (\sqrt{5} \times \sqrt{5}) \times \sqrt{5}^{12}$$

$$= \sqrt{5}^{19}$$

$$= 5^9 \sqrt{5}$$

$$= \sqrt{2}^{-4}$$

$$= \frac{1}{\sqrt{2}^4}$$

$$= \frac{1}{2^2}$$

$$= \frac{1}{4}$$



$$\sqrt{3}^{-8} \times \sqrt{3}^{-6} = \sqrt{3}^{-8-6}$$

$$= \sqrt{3}^{-14}$$

$$= \frac{1}{\sqrt{3}^{14}}$$

$$= \frac{1}{3^7}$$

$$(-\sqrt{2})^5 \times (-\sqrt{2})^3$$

$$= (-\sqrt{2})^8$$

$$= \sqrt{2}^8$$

$$= 2^4$$

$$9 \times \sqrt{3}^{14}$$

$$= \sqrt{3}^4 \times \sqrt{3}^{14}$$

$$= \sqrt{3}^{18}$$

$$= 3^9$$

$$2\sqrt{2} \times \sqrt{2}^{14} = \sqrt{2}^3 \times \sqrt{2}^{14}$$

$$= \sqrt{2}^{17}$$

$$= 2^7$$

$$\frac{1}{3} \times \sqrt{3}^{19} = \sqrt{3}^2 \times \sqrt{3}^{19} = \sqrt{3}^{21}$$

$$= 3^8 \sqrt{3}$$

التلميذ: يحيى الحاجي
الأستاذ: محمد الجيب الغزلاني

نظيفة 2

$$a = (-\sqrt{3})^4 \times \sqrt{3}^5$$

$$= \sqrt{3}^4 \times \sqrt{3}^5$$

$$= \sqrt{3}^9$$

$$b = \left(\frac{\sqrt{3}}{2}\right)^{15} \times \left(\frac{2}{\sqrt{3}}\right)^7$$

$$= \left(\frac{\sqrt{3}}{2}\right)^{15} \times \left(\frac{\sqrt{3}}{2}\right)^{-7}$$

$$= \left(\frac{\sqrt{3}}{2}\right)^8$$

نفس المارين A و B حيث

1. نثبت ان $a = \sqrt{3}^9$ و $b = \left(\frac{\sqrt{3}}{2}\right)^8$

سابعة 3

اداءه و ب عددان صحيحين وماليتين لهن و n عدد موجب نسبيا فيان

$$a^n \times b^n = (a \times b)^n$$



نظيفة

الكتب في صيغة قوة

$$\sqrt{2}^9 \times \sqrt{2}^9 = \sqrt{2}^{18}$$

$$\sqrt{2}^{-13} \times \sqrt{2}^{-13} = \sqrt{2}^{-26}$$

$$(-\sqrt{5})^{11} \times (-2\sqrt{5})^{11} = ((-\sqrt{5}) \times (-2\sqrt{5}))^{11} = 10^{11}$$

$$\left(\frac{3}{\sqrt{2}}\right)^{-19} \times \left(\frac{7}{6}\right)^{-19} = \left(\frac{3 \times \sqrt{2} \times \sqrt{2}}{\sqrt{2} \times 6}\right)^{-19} = \left(\frac{\sqrt{2}}{2}\right)^{-19}$$





$$a = \sqrt{15^{17}} \times \sqrt{3^{17}}$$

$$= \sqrt{3^{17}} \times \sqrt{5^{17}} \times \sqrt{3^{17}}$$

$$a = 3^{17} \times 15^{17}$$

التلميذ : يحيى الحاجي

$$E = 4a^3 \times 2b^{-12} \times \frac{ab}{8}$$

تعريف منزلي

$$E = a^6 \times b^{-9}$$

خاصية 4

ان كان عدد طبيعي وهو عددي صحيح نكتبه في صورة

$$(a^m)^n = a^{m \times n}$$

نطبق

التي في صيغة قوت

$$(\sqrt{3}^3)^{-4} = \sqrt{3}^{-12} = \frac{1}{\sqrt{3}^{12}} = \frac{1}{3^6} = \left(\frac{1}{3}\right)^6$$

$$((- \sqrt{3})^{-6})^{-5} = (- \sqrt{3})^{30} = 3^{15} \times (- \sqrt{3})^{30} = 3^{15}$$

$$\left(\frac{4}{3}\right)^5 \times \left(\frac{2}{\sqrt{3}}\right)^6 = \left(\frac{4}{3}\right)^5 \times \left(\frac{2}{\sqrt{3}}\right)^2 \times \left(\frac{2}{\sqrt{3}}\right)^4 = \left(\frac{4}{3}\right)^5 \times \left(\frac{4}{3}\right)^3 = \left(\frac{4}{3}\right)^8$$

$$((\sqrt{5})^{-4})^3 \times (\sqrt{5}^2) = \sqrt{5}^{12} \times \sqrt{5} = 5^{-12}$$

$$3^4 \times \sqrt{3}^{17} = \sqrt{3}^8 \times \sqrt{3}^{17} = \sqrt{3}^{25}$$

$$(5\sqrt{5})^{-6} \times \sqrt{5}^{-23} = (\sqrt{5}^3)^{-6} \times \sqrt{5}^{-23} = \sqrt{5}^{-18} \times \sqrt{5}^{-23} = \sqrt{5}^{-41} = \frac{1}{\sqrt{5}^{41}}$$

$$= \left(\frac{1}{\sqrt{5}}\right)^{41}$$



$$a = 3^2 \times \left(\frac{1}{\sqrt{3}}\right)^{18}$$

$$= 3^2 \times \frac{1}{3^9}$$

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

$$= \frac{1}{3^7}$$

$$= \frac{1}{9}$$

$$a = \frac{1}{9} \text{ ان } a = 3^2 \times \left(\frac{1}{\sqrt{3}}\right)^{18}$$

$$b = 10^{-3} \text{ ان } b = 1000^2 \times (0,01)^{12}$$

$$b = 1000^2 \times (0,01)^{12}$$

$$= (10^3)^2 \times (10^{-2})^{12}$$

$$= 10^{21} \times 10^{-24}$$

$$b = 10^{-3}$$





اضرب العبارتين التاليتين

$$a \in \mathbb{R}_+, b \in \mathbb{R}_+$$

$$A = \frac{(ab^4)^{-3} \times b^7}{(a^2 \times b^{-5})^{-3}}$$

$$= \frac{a^{-3} \times b^{-12} \times b^7}{a^{-6} \times b^{15}}$$

$$= a^{-3} \times a^6 \times b^{-12} \times b^7 \times b^{-15}$$

$$A = a^3 \times b^{-10}$$

$$B = \frac{(a^3 b^4 c^2)^5 \times b^3}{(a^{-4} b)^2 \times c^5}$$

$$= \frac{a^{15} \times b^{20} \times c^{10} \times b^3}{a^{-8} \times b^2 \times c^5}$$

$$= a^{15} \times a^8 \times b^{20} \times b^{-2} \times b^3 \times c^{10} \times c^{-5}$$

$$B = a^{23} \times b^{21} \times c^{15}$$

سأعطيك

إذا كان عدد حقيقي مخالف لـ m عدد صحيح نسبي فإن

$$\frac{a^m}{b^m} = \left(\frac{a}{b}\right)^m$$

التلميذ: يحيى الحاجي

طبيب

المب فيه صيغة قوية

$$\left(\frac{\sqrt{2}}{3}\right)^{13} = \left(\frac{\frac{\sqrt{2}}{3}}{\frac{3}{\sqrt{2}}}\right)^{13} = \left(\frac{\sqrt{2}}{3} \times \frac{\sqrt{2}}{3}\right)^{13} = \left(\frac{2}{9}\right)^{13}$$



$$\left(\frac{\left(\frac{3\sqrt{2}}{5}\right)^{11}}{\left(\frac{2\sqrt{2}}{15}\right)^{11}}\right) = \left(\frac{3\sqrt{2}}{5} \times \frac{15}{2\sqrt{2}}\right)^{11} = \left(\frac{9}{2}\right)^{11}$$

$$(3\sqrt{2})^6 = \frac{7^6 \times 9^{12}}{\sqrt{2}^6 \times (3\sqrt{3})^{12}}$$

$$\begin{aligned} \frac{7^6 \times 9^{12}}{\sqrt{2}^6 \times (3\sqrt{3})^{12}} &= \frac{7^6 \times 9^{12}}{2^3 \times (\sqrt{2}^3)^{12}} = \frac{7^6 \times 9^{12}}{2^3 \times \sqrt{2}^{36}} = \frac{7^6 \times 9^{12}}{2^3 \times 2^{18}} = \frac{7^6 \times 9^{12}}{2^{21}} = 7^6 \times 2^{-21} \times (3^2)^{12} \times 3^{-18} \\ &= 7^6 \times 3^{24} \times 3^{-18} \\ &= 7^6 \times 3^6 \\ &= \sqrt{7}^6 \times 3^6 \end{aligned}$$

سأعطيك

إذا كان عدد حقيقي مخالف لـ m عددين موجبين نسبين فإن

$$\frac{a^m}{a^m} = a^m \times a^{-m} = a^{m-m}$$





اضرب العبارتين التاليتين

$$a \in \mathbb{R}_+, b \in \mathbb{R}_+$$

$$A = \frac{(ab^4)^{-3} \times b^7}{(a^2 \times b^{-5})^{-3}}$$

$$= \frac{a^{-3} \times b^{-12} \times b^7}{a^{-6} \times b^{15}}$$

$$= a^{-3} \times a^6 \times b^{-6} \times b^7 \times b^{-15}$$

$$A = a^3 \times b^{-14}$$

$$B = \frac{(a^3 b^4 c^{-3})^5 \times b^3}{(a^{-4} b)^2 \times c^5}$$

$$= \frac{a^{15} \times b^{20} \times c^{-15} \times b^3}{a^{-8} \times b^2 \times c^5}$$

$$= a^{15} \times a^8 \times b^{20} \times b^{-2} \times b^{-3} \times c^{-10} \times c^{-5}$$

$$B = a^{23} \times b^{18} \times c^{-15}$$

سأثبت

إذا كان a و b صفتين مختلفتين لعدد m عدد صحيح نسبي فإن

$$\frac{a^m}{b^m} = \left(\frac{a}{b}\right)^m$$

التلميذ: يحيى الحاجي

طبيب

المب في صيغة قوة

$$\left(\frac{\sqrt{2}}{3}\right)^{13} = \left(\frac{\frac{\sqrt{2}}{3}}{\frac{3}{\sqrt{2}}}\right)^{13} = \left(\frac{\sqrt{2}}{3} \times \frac{\sqrt{2}}{3}\right)^{13} = \left(\frac{2}{9}\right)^{13}$$



$$\left(\frac{\left(\frac{3\sqrt{2}}{5}\right)^{11}}{\left(\frac{2\sqrt{2}}{15}\right)^{11}}\right) = \left(\frac{3\sqrt{2}}{5} \times \frac{15}{2\sqrt{2}}\right)^{11} = \left(\frac{9}{2}\right)^{11}$$

$$(3\sqrt{2})^6 = \frac{7^6 \times 9^{12}}{\sqrt{2}^6 \times (3\sqrt{3})^{12}}$$

$$\frac{7^6 \times 9^{12}}{\sqrt{2}^6 \times (3\sqrt{3})^{12}} = \frac{7^6 \times 9^{12}}{2^3 \times (\sqrt{2}^3)^{12}} = \frac{7^6 \times 9^{12}}{2^3 \times \sqrt{2}^{36}} = \frac{7^6 \times 9^{12}}{2^3 \times 2^{18}} = \frac{7^6 \times 9^{12}}{2^{21}} = 7^6 \times 2^{-3} \times (3^2)^{12} \times 3^{-18}$$

$$= 7^6 \times 3^{24} \times 3^{-18}$$

$$= 7^6 \times 3^6$$

$$= \sqrt{7}^6 \times 3^6$$

سأثبت

إذا كان a و b صفتين مختلفتين لعدد m عدد صحيح نسبي فإن

$$\frac{a^m}{a^m} = a^m \times a^{-m} = a^{m-m}$$





تطبيق

اكتب اية صيغة فتوة :

$$\frac{\sqrt{3}^{15}}{\sqrt{3}^{22}} = \sqrt{3}^{15-22} = \frac{1}{\sqrt{3}^7} = \left(\frac{1}{3}\right)^{\frac{7}{2}}$$

$$\frac{(-\sqrt{5})^{-2}}{(-\sqrt{5})^{-9}} = (-\sqrt{5})^{-2+9} = (-\sqrt{5})^7 = -\sqrt{5}^7$$

$$\frac{(2\sqrt{5})^2}{(2\sqrt{5})^7} = \frac{(2\sqrt{5})^2}{(2\sqrt{5})^7} = (2\sqrt{5})^{2-7} = (2\sqrt{5})^{-5} = \frac{1}{(2\sqrt{5})^5} = \left(\frac{1}{2\sqrt{5} \times 4\sqrt{5}}\right) \left(\frac{\sqrt{5}}{10}\right)^2$$

اصح نسفا 5 مبدع 60

$$A = \frac{\left(\frac{\sqrt{2}}{3}\right)^2}{\left(\frac{\sqrt{2}}{7}\right)^3} = \left(\frac{\frac{\sqrt{2}}{3}}{\frac{\sqrt{2}}{7}}\right)^3 = \left(\frac{7}{3}\right)^3$$

$$b = \frac{\left(\frac{-\sqrt{3}}{\pi}\right)^5}{\left(\frac{2}{\pi}\right)^5} = \left(\frac{\frac{-\sqrt{3}}{\pi}}{\frac{2}{\pi}}\right)^5 = \left(\frac{-\sqrt{3}}{2}\right)^5$$

$$e = \frac{4\pi^2}{81} = \left(\frac{2\pi}{9}\right)^2$$

$$C = \frac{(-2)^2}{\left(\frac{1}{\sqrt{2}}\right)^2} = \left(\frac{-2}{\frac{1}{\sqrt{2}}}\right)^2 = (2\sqrt{2})^2$$

$$D = \frac{(1,3)^4}{\left(\frac{\sqrt{13}}{5}\right)^4} = \frac{13}{\frac{\sqrt{13}}{5}} = \left(\frac{\sqrt{13} \times \sqrt{13}}{5 \times 2} \times \frac{5}{\sqrt{13}}\right)^4$$

$$= \left(\frac{\sqrt{13}}{2}\right)^4 = \left(\left(\frac{\sqrt{13}}{2}\right)^2\right)^2 = \left(\frac{13}{4}\right)^2$$

التلميذ : يحيى الحاجي

اصح تعرف 6 مبدع 60

$$A = \frac{2,5 \times 10^{14}}{5 \times 10^{12}}$$

$$= \frac{2,5 \times 10^{-1} \times 10^{14}}{5 \times 10^{12}}$$

$$= 5 \times 10^{-1} \times 10^{-12} \times 10^{14}$$

$$= 5 \times 10$$

$$A = 50$$

$$B = \frac{36 \times 10^{-5}}{9 \times 10^4}$$

$$B = 4 \times 10^{-9}$$

$$C = \frac{0,28 \times 10^{-3}}{\sqrt{7} \times 10^{-5}}$$

$$= \frac{28 \times 10^{-2} \times 10^{-9}}{\sqrt{7} \times 10^{-5}}$$

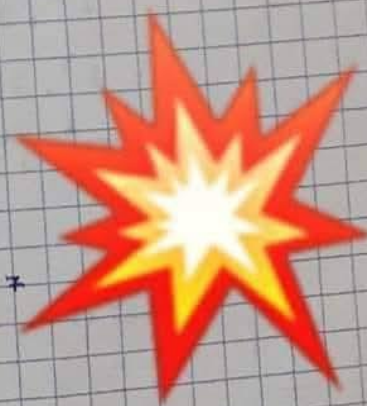
$$C = 4\sqrt{7}$$

$$D = \frac{0,0005 \times 10^7}{\sqrt{3} \times 10^{-5}}$$

$$= \frac{5 \times 10^{-4} \times 10^7}{\sqrt{3} \times 10^{-5}}$$

$$= \frac{\sqrt{3} \times \sqrt{3}}{\sqrt{3}} \times 10^{-4+7+5}$$

$$D = \sqrt{3} \times 10^8$$





نفس المبرهنين : $b \in \mathbb{R}, a \in \mathbb{R}$ حيث $B = a^2 b^3 + (ab)^4$ $\Ã$ $A = \frac{(ab^2)^{-4} \times ab^{-3}}{(a^2 b^{-3}) \times a^{-1}}$



1. حسب القيمة العددية لـ B حيث $ab = (\frac{\sqrt{2}}{2})^{-3}$ و $b = \sqrt{2}$

2. $B = b - 1$ ان امكن a و b عددا من قلوبان

ب. استنتج قيمة B ان امكن $a = \sqrt{3}$ و b مقلوب b

3 (مؤال تفكر) اوجد a حيث $(\sqrt{3} \sqrt{2})^{3a+1} = 1$

4 (مؤال تفكر) اوجد b حيث $3^{4b} \cdot b = 24 = \sqrt{3}^{4b}$

$$A = \frac{(ab^2)^{-4} \times ab^{-3}}{a^2 b^{-7}} = \frac{a^{-4} \times b^{-8} \times a^2 \times b^{-3} \times b^7}{a \times b^{-7}}$$

$$B = a^2 b^3 + (ab)^4$$

$$B = (ab)^2 = a^2 \times b^3$$

$$B = a^4 \times b^4 = A$$

ان $A = b - a^4 \times b^4$

في حالة $b = \sqrt{2}$ $\Ã$ $ab = (\frac{\sqrt{2}}{2})^{-3}$ $\Ã$ $a = \frac{1}{2}$

$$A = a^2 b^3 = a^2 b^2 \times b = (ab)^2 \times b$$

$$= \left[\left(\frac{\sqrt{2}}{2} \right)^{-3} \right]^2 \times \sqrt{2}$$

$$= \left[\frac{2}{\sqrt{2}} \right]^6 \times \sqrt{2}$$

$$= \frac{2^6}{2^3} \times \sqrt{2} \Rightarrow 8\sqrt{2}$$

التلميذ : يحيى الحاجي

a و b مقلوبان يعني $b = \frac{1}{a}$

$$B = a^2 b^3 + (ab)^4$$

$$= a^2 \times \left(\frac{1}{a} \right)^3 + 1$$

$$= \frac{a^2}{a^3} + 1$$

$$= \frac{1}{a} + 1 = B = b + 1$$



بـ a مقلوب b

$b = (\sqrt{3} + 1)$ يعني $a = \sqrt{3} + 1$

$$B = \frac{1}{\sqrt{3} + 1} + 1$$

يعني





$$= \frac{\sqrt{3}-1}{(\sqrt{3})+1} + 1$$

$$= \frac{\sqrt{3}-1}{2} + \frac{1 \cdot 2}{2}$$

$$= \frac{\sqrt{3}-1+2}{2} \Rightarrow B = \frac{\sqrt{3}+1}{2}$$

$$\begin{aligned} (\sqrt{3} \sin) 3a+1 &= \sqrt{3}^0 \\ \sqrt{3} \sin(3a+1) &= \sqrt{3}^0 \end{aligned}$$

اصح تعريف

3

$$\sin(3a+1)=0 \quad \text{يعني}$$

$$\left. \begin{aligned} a \neq 0 \\ a = -\frac{1}{3} \end{aligned} \right\} \begin{aligned} \text{وبما أن} \\ \text{فإن} \end{aligned} \left\{ \begin{aligned} a &= 0 \\ a &= -\frac{1}{3} \end{aligned} \right. \text{يعني} \left\{ \begin{aligned} \sin a &= 0 \\ 3a+1 &= 0 \end{aligned} \right.$$

$$\begin{aligned} 3^{42} b &= 27^8 \times \sqrt{3}^{40} \\ b &= \frac{27^8 \times \sqrt{3}^{40}}{3^{42}} \\ &= \frac{3^{24} \times 3^{20}}{3^{42}} = \frac{3^{44}}{3^{42}} \end{aligned}$$

حمام الشط
برج السدرية



التلميذ: يحيى الحاجي

مستأن جدياً

شكراً



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