

Binomial squared $(x+y)^2 = (x)^2 + 2(x)(y) + (y)^2$
 $= x^2 + 2xy + y^2$

Difference of two squares $x^2 - y^2 = (x - y)(x + y)$

Binomial cubed $(x+y)^3 = (x)^3 + 3(x)^2(y) + 3(x)(y)^2 + (y)^3$

Exp ① $(x+4)^2 = x^2 + 2(x)(4) + (4)^2$
 $= x^2 + 8x + 16$

② $(x+4)^3 = x^3 + 3(x)^2(4) + 3(4)^2(x) + (4)^3$
 $= x^3 + 12x^2 + 48x + 64$

③ $(x^2 - y^3)^2 = (x^2)^2 + 2(x^2)(-y^3) + (-y^3)^2$
 $= x^4 - 2x^2y^3 + y^6$

④ $(x^2 - \frac{1}{2})^3 = (x^2)^3 + 3(x^2)^2(-\frac{1}{2}) + 3(-\frac{1}{2})^2(x^2) + (-\frac{1}{2})^3$
 $= x^6 - \frac{3}{2}x^4 + \frac{3}{4}x^2 - \frac{1}{8}$

$$\frac{2}{x} = 2x^{-1} \quad \frac{-1}{2} = -\frac{1}{2}x^0$$

$$= x^6 - \frac{3}{2}x^4 + 3\left(-\frac{1}{2}\right)\left(-\frac{1}{2}\right)x^2 + \left(-\frac{1}{2}\right)\left(-\frac{1}{2}\right)\left(-\frac{1}{2}\right)$$

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

$$= x^6 - \frac{3}{2}x^4 + \frac{3}{4}x^2 - \frac{1}{8}$$

$$\textcircled{5} \quad x^2 - 9 = (x - 3)(x + 3)$$

$$\textcircled{6} \quad y^2 - 6 = (y - \sqrt{6})(y + \sqrt{6})$$

$$\sqrt{6}\sqrt{6} = \sqrt{6 \cdot 6} = \sqrt{36} = 6$$

Exp Simply

$$\textcircled{1} \quad 2\sqrt{3} - 3x\sqrt{y} - 7\sqrt{3} + 9x\sqrt{y} - (3\sqrt{3} - 2x\sqrt{y})$$

$$-3\sqrt{3} + 2x\sqrt{y}$$

$$2\sqrt{3} - 7\sqrt{3} - 3\sqrt{3} - 3x\sqrt{y} + 9x\sqrt{y} + 2x\sqrt{y}$$

like terms

$$\sqrt{3}(2 - 7 - 3) + x\sqrt{y}[-3 + 9 + 2]$$

$$-8\sqrt{3} + 8x\sqrt{y} \quad \checkmark$$

$$8[-\sqrt{3} + x\sqrt{y}] \quad \checkmark$$

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$$\begin{aligned}
 & 8 \sqrt{-\sqrt{3} + x^{\frac{5}{3}}} \\
 & x^{-\frac{2}{3}} \left(x^{\frac{5}{3}} - x^{-\frac{1}{3}} \right) = x^{-\frac{2}{3}} \cdot x^{\frac{5}{3}} - x^{-\frac{2}{3}} \cdot x^{-\frac{1}{3}} \\
 & = x^{-\frac{2}{3} + \frac{5}{3}} - x^{-\frac{2}{3} + -\frac{1}{3}} \\
 & = x^{\frac{3}{3}} - x^{-\frac{3}{3}} \\
 & = x - x^{-1} \\
 & = x - \frac{1}{x} \quad \checkmark
 \end{aligned}$$

$$\begin{aligned}
 & 3 \quad \left(\sqrt{x} - \sqrt[3]{x} \right)^2 = \left(\sqrt{x} \right)^2 + 2(\sqrt{x})(-\sqrt[3]{x}) + \left(\sqrt[3]{x} \right)^2 \\
 & \quad \sqrt{x} = x^{\frac{1}{2}} \quad \sqrt[3]{x} = x^{\frac{1}{3}} \\
 & = \left(x^{\frac{1}{2}} \right)^2 - 2 x^{\frac{1}{2}} \cdot x^{\frac{1}{3}} + \left(x^{\frac{1}{3}} \right)^2 \\
 & = x^{\frac{2}{2}} - 2 x^{\frac{3 \cdot \frac{1}{2} + \frac{1}{3} \cdot 2}{3}} + x^{\frac{2}{3}} \\
 & = x - 2 x^{\frac{\frac{3}{6} + \frac{2}{6}}{3}} + x^{\frac{2}{3}} \\
 & = x - 2 x^{\frac{5}{6}} + x^{\frac{2}{3}} \\
 & = x - 2 \sqrt[6]{x^5} + \sqrt[3]{x^2}
 \end{aligned}$$

$$4 \quad (\sqrt{4} - 2)(\sqrt{4} + 2) = (\sqrt{4})^2 - 2^2 = 4 - 4 = 0$$

④ $(\sqrt{y} - 2)(\sqrt{y} + 2) = (\sqrt{y})^2 - 2^2$
 $= y - 4$ طريقة سريعة

$\sqrt{y} \cdot \sqrt{y} + \sqrt{y} \cdot 2 + (-2) \cdot \sqrt{y} + (-2)(2)$

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

⑤ $(\sqrt[3]{x} - \sqrt{x})(\sqrt[3]{x} + \sqrt{x}) = (\sqrt[3]{x})^2 - (\sqrt{x})^2$

or $(\sqrt[3]{x})(\sqrt[3]{x}) + \cancel{(\sqrt[3]{x})(\sqrt{x})} + \cancel{(-\sqrt{x})(\sqrt[3]{x})} + (-\sqrt{x})(\sqrt{x})$
 $= \left(x^{\frac{1}{3}}\right)^2 - \left(x^{\frac{1}{2}}\right)^2$
 $= x^{\frac{2}{3}} - x$

$\frac{1}{3} \cdot \frac{1}{3} - \frac{1}{2} \cdot \frac{1}{2}$
 $\frac{2}{3} - \frac{2}{2}$
 $x^{\frac{2}{3}} - x$

القسمة الطويلة

Long Division

$\frac{\text{Poly}}{\text{Poly}}$
 كثير حدود / كثير حدود

Exp Divide

$4x^3 - 13x - 22$

by $x - 3$
 كثير حدود من درجة 1 / المقسم عليه

$4x^2 + 12x + 23$
 الناتج / The quotient

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

$$\begin{array}{r} 4x^2 + 12x + 23 \\ \underline{-(x - 3)} \\ 4x^3 - 13x - 22 \end{array}$$

$$\begin{array}{r} -4x^3 + 12x^2 \\ \hline 12x^2 - 13x - 22 \end{array}$$

Answer

$$\frac{4x^3 - 13x - 22}{x - 3} = 4x^2 + 12x + 23 + \frac{47}{x - 3}$$

The quotient

القسمة

الباقي

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Remainder

Exp Use long Division to find

$$(x^3 + x - 1) \div (x + 2)$$

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

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

Answer

$$\begin{array}{r} x^2 - 2x + 5 \\ \underline{-(x + 2)} \\ x^3 + x - 1 \end{array}$$

$$\begin{array}{r} -x^3 - 2x^2 \\ \hline -2x^2 + x - 1 \end{array}$$

$$\begin{array}{r} -2x^2 + x - 1 \\ \hline +2x^2 + 4x + \end{array}$$

The quotient

$$\frac{x^3 + x - 1}{x + 2} = \boxed{x^2 - 2x + 5} + \frac{-11}{x+2}$$

The quotient

$$\begin{array}{r} +2x^2 + 4x + \\ \hline x^3 + x - 1 \\ -2x^2 - 4x - 10 \\ \hline 5x - 11 \\ -5x - 10 \\ \hline -11 \end{array}$$

stop

Remainder