

Aritmetikk / Algebra - Løsningsforslag

01.

$$\begin{aligned} \frac{1}{x} + \frac{5}{x+1} - \frac{1+4x}{x^2+x} &= \frac{1}{x} + \frac{5}{x+1} - \frac{1+4x}{x(x+1)} = && f.n : x(x+1) \\ \frac{x+1}{x(x+1)} + \frac{5x}{x(x+1)} - \frac{1+4x}{x(x+1)} &= \frac{x+1+5x-1-4x}{x(x+1)} \\ \frac{2x}{x(x+1)} &= \frac{2}{\underline{\underline{x+1}}} \end{aligned}$$

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02.

$$\begin{aligned} \frac{x(xy^2 - y) - y(xy^2 - x)}{x^3 - xy^2} &= \frac{x^2y^2 - xy - xy^3 + xy}{x(x^2 - y^2)} \\ &= \frac{\cancel{x}y^2(\cancel{x-y})}{\cancel{x}(x-y)(x+y)} = \frac{y^2}{\underline{\underline{x+y}}} \end{aligned}$$

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03.

$$\begin{aligned} \frac{(3b)^2 \cdot \left(\frac{9}{b}\right)^{-2} \cdot b^{\frac{2}{3}}}{\sqrt[3]{b^2} \cdot \sqrt{\frac{b^4}{9}}} &= \frac{3^2 b^2 \cdot 3^{-4} \cdot b^2 \cdot b^{\frac{2}{3}}}{b^{\frac{2}{3}} \cdot 3^{-1} \cdot b^2} = \\ 3^{2-4-(-1)} \cdot b^{2+2+\frac{2}{3}-\frac{2}{3}-2} &= 3^{-1} \cdot b^2 = \frac{b^2}{\underline{\underline{3}}} \end{aligned}$$

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04.

$$\begin{aligned} \frac{x}{x-2} + \frac{x}{x+2} - \frac{x^2}{x^2-4} &= \frac{x}{x-2} + \frac{x}{x+2} - \frac{x^2}{(x-2)(x+2)} = \frac{x(x+2) + x(x-2) - x^2}{(x-2)(x+2)} \\ &= \frac{x^2 + 2x + x^2 - 2x - x^2}{(x-2)(x+2)} = \frac{x^2}{(x-2)(x+2)} \\ &= \frac{x^2}{\underline{\underline{x^2-4}}} \end{aligned}$$

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05.

$$\begin{aligned} \frac{\frac{4}{\sqrt{x}} \cdot \sqrt[6]{x^3} \cdot \left(x^{\frac{5}{2}}\right)^4}{x^{\frac{2}{3}} \cdot \left(\sqrt[3]{x}\right)^2} &= \frac{4x^{-\frac{1}{2}} \cdot x^{\frac{3}{6}} \cdot x^{\frac{20}{2}}}{x^{\frac{2}{3}} \cdot x^{\frac{2}{3}}} \\ &= 4x^{-\frac{1}{2}} \cdot x^{\frac{3}{6}} \cdot x^{\frac{20}{2}} \cdot x^{-\frac{4}{3}} \\ &= 4x^{-\frac{3}{6} + \frac{3}{6} + 10 - \frac{8}{6}} = 4x^{\frac{52}{6}} = 4x^{8\frac{4}{6}} \\ &= 4x^8 \cdot x^{\frac{2}{3}} = \underline{\underline{4x^8 \cdot \sqrt[3]{x^2}}} \end{aligned}$$

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06.

$$\begin{aligned} \frac{(2a)^3 \cdot \left(\frac{a}{4}\right)^{-2} \cdot \frac{4}{a}}{\left(\frac{a}{2}\right)^{-4} \cdot (8a^2)^2} &= \frac{8a^3 \cdot \left(\frac{4}{a}\right)^2 \cdot \frac{4}{a}}{\left(\frac{a}{2}\right)^{-4} \cdot 64a^4} \\ &= 8a^3 \cdot \frac{16}{a^2} \cdot \frac{4}{a} \cdot \left(\frac{a}{2}\right)^4 \cdot \frac{1}{64} a^{-4} \\ &= \frac{8 \cdot 16 \cdot 4}{2^4 \cdot 64} \cdot a^{3-2-1+4-4} = \frac{1}{2^1} \cdot a^0 = \underline{\underline{\frac{1}{2}}} \end{aligned}$$

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07.

$$\begin{aligned} b(a-3b) + (a+b)(a-b) - ab &= \\ \cancel{ba} - 3b^2 + a^2 - b^2 - \cancel{ab} &= \\ a^2 - 4b^2 &= \underline{\underline{(a-2b)(a+2b)}} \end{aligned}$$

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08.

$$\frac{(9ab^4 - 9a^2b^3)(a+b)}{3b^2(a^2 - b^2)} = \frac{9ab^3(b-a)(a+b)}{3b^2(a-b)(a+b)} =$$

$$\frac{3ab(b-a)}{(a-b)} = \underline{\underline{-3ab}}$$

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09.

$$\frac{(2a)^{12} \cdot a^{-5} \cdot \sqrt[3]{b}}{16a^4 \cdot (a^3)^{-2} \cdot b^{-\frac{4}{3}}} = \frac{2^{12} \cdot a^{12} \cdot a^{-5} \cdot b^{\frac{1}{3}}}{2^4 \cdot a^4 \cdot a^{-6} \cdot b^{-\frac{4}{3}}} =$$

$$2^{12-4} \cdot a^{12+(-5)-4-(-6)} \cdot b^{\frac{1}{3}-(-\frac{4}{3})} = 2^8 a^9 b^{\frac{5}{3}} = \underline{\underline{2^8 a^9 \sqrt[3]{b^5}}}$$

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10.

$$2a^2 + (1-a)(1+a) + 2a$$

$$= 2a^2 + 1 - a^2 + 2a = a^2 + 2a + 1 = \underline{\underline{(a+1)^2}}$$

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11. a) $\frac{a^2 \cdot a^3 \cdot (a^2)^3}{(a^{-1})^3 \cdot a^0} = \frac{a^2 \cdot a^3 \cdot a^6}{a^{-3} \cdot 1} = a^{2+3+6+3} = \underline{\underline{a^{14}}}$

b) $\frac{ab}{a^2 - 4} : \frac{b}{a-2} = \frac{ab}{a^2 - 4} \cdot \frac{a-2}{b} = \frac{\cancel{a}b}{(\cancel{a-2})(a+2)} \cdot \frac{\cancel{a-2}}{\cancel{b}} = \underline{\underline{\frac{a}{a+2}}}$

c) $\frac{3x^2 + 6x}{x^3 - 4x} = \frac{3\cancel{x}(x+2)}{\cancel{x}(x-2)(x+2)} = \underline{\underline{\frac{3}{x-2}}}$

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$$12. \quad a) \quad \frac{6ab^4 - 6a^2b^3}{2b^2(a^2 - b^2)} = \frac{6ab^3(b - a)}{2b^2(a - b)(a + b)} = \frac{-3ab(a - b)}{(a - b)(a + b)} = \underline{\underline{\frac{3ab}{a + b}}}$$

$$b) \quad \frac{(2a)^3 \cdot a^{-5} \cdot \sqrt[3]{b}}{a^4 \cdot (a^3)^{-2} \cdot b^{-\frac{2}{3}}} = \frac{2^3 \cdot a^3 \cdot a^{-5} \cdot b^{\frac{1}{3}} \cdot a^{-4} \cdot a^6 \cdot b^{\frac{2}{3}}}{a^4 \cdot a^6 \cdot b^{-\frac{2}{3}}} = \underline{\underline{8b}}$$

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$$13. \quad \frac{(a + b)^2 - (a - b)^2}{\frac{4}{b}} = \frac{a^2 + 2ab + b^2 - (a^2 - 2ab + b^2)}{\frac{4}{b}} = 4ab \cdot \frac{b}{4} = \underline{\underline{ab^2}}$$

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$$14. \quad a) \quad \frac{a^3 \cdot (25a^2 - 36b^2)}{a^2 \cdot (5a + 6b)} = \frac{a \cdot \cancel{a^2} (5a - 6b) \cancel{(5a + 6b)}}{\cancel{a^2} (5a + 6b)} = \underline{\underline{5a^2 - 6ab}}$$

$$b) \quad \frac{a^{14} \cdot b^{\frac{2}{3}} \cdot \sqrt{b}}{(a^2 \cdot b)^{-2} \cdot \sqrt[3]{a^2}} = \frac{a^{14} \cdot b^{\frac{2}{3}} \cdot b^{\frac{1}{2}}}{a^{-4} \cdot b^{-2} \cdot a^{\frac{2}{3}}} = a^{14+4-\frac{2}{3}} \cdot b^{\frac{2}{3}+\frac{1}{2}+2} = \underline{\underline{a^{\frac{52}{3}} \cdot b^{\frac{19}{6}}}}$$

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$$15. \quad a) \quad \frac{3a^2 - 6ab + 3b^2}{6(a - b)} = \frac{3(a^2 - 2ab + b^2)}{6(a - b)} = \frac{3(a - b)^2}{6(a - b)} = \underline{\underline{\frac{a - b}{2}}}$$

$$b) \quad \frac{ab - 2b}{a^2b - 4b} = \frac{b(a - 2)}{b(a^2 - 4)} = \frac{a - 2}{a^2 - 2^2} = \frac{a - 2}{(a - 2)(a + 2)} = \underline{\underline{\frac{1}{a + 2}}}$$

$$c) \quad \frac{(a + b)^2 - (a - b)^2}{\frac{4}{b}} = \frac{a^2 + 2ab + b^2 - (a^2 - 2ab + b^2)}{\frac{4}{b}} = \frac{4ab}{\frac{4}{b}} = \frac{4ab \cdot b}{4} = \underline{\underline{ab^2}}$$

$$d) \quad \frac{(\sqrt{a})^3 \cdot (2a)^{-1} \cdot (a^5)^{\frac{1}{2}}}{(5a)^2 \cdot a^{-4}} = \frac{a^{\frac{3}{2}} \cdot 2^{-1} \cdot a^{-1} \cdot a^{\frac{5}{2}}}{5^2 \cdot a^2 \cdot a^{-4}} = \frac{2^{-1} \cdot a^{-2}}{25 \cdot a^{-2}} = \underline{\underline{\frac{1}{50}}}$$

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