

$$\begin{aligned} \left(\left(-\frac{2}{3} \right)^6 : \left(\frac{2}{3} \right)^9 \cdot \left(\frac{4}{3} \right)^2 \right)^{-1} &= \left(\left(\frac{2}{3} \right)^6 : \left(\frac{2}{3} \right)^9 \cdot \left(\frac{4}{3} \right)^2 \right)^{-1} = \left(\left(\frac{2}{3} \right)^{-3} \cdot \left(\frac{4}{3} \right)^2 \right)^{-1} = \left(\left(\frac{3}{2} \right)^3 \cdot \left(\frac{4}{3} \right)^2 \right)^{-1} = \\ &= \left(\frac{3^3 \cdot 2^4}{2^3 \cdot 3^2} \right)^{-1} = (3 \cdot 2)^{-1} = 6^{-1} = \frac{1}{6} \end{aligned}$$

$$\begin{aligned} \left(1 + \frac{1}{2} \right)^3 : \left(\frac{3}{4} : \frac{1}{2} - 1 \right)^3 &= \left(\frac{3}{2} \right)^3 : \left(\frac{3}{4} \cdot 2 - 1 \right)^3 = \left(\frac{3}{2} \right)^3 : \left(\frac{3}{4} \cdot 2 - 1 \right)^3 = \left(\frac{3}{2} \right)^3 : \left(\frac{3}{2} - 1 \right)^3 = \\ &= \left(\frac{3}{2} \right)^3 : \left(\frac{1}{2} \right)^3 = \left(\frac{3}{2} : \frac{1}{2} \right)^3 = \left(\frac{3}{2} \cdot 2 \right)^3 = 3^3 = 27 \end{aligned}$$

$$\begin{aligned} \left(\frac{2}{a+2} - \frac{1}{a} \right) : \frac{2-a}{2a} &= \left(\frac{2a-a-2}{a(a+2)} \right) \cdot \frac{2a}{2-a} = \frac{a-2}{a(a+2)} \cdot \frac{2a}{-(-2+a)} = \\ &= \frac{a-2}{a(a+2)} \cdot \frac{-2a}{a-2} = \frac{-2a}{a(a+2)} = \frac{-2}{a+2} \end{aligned}$$

$$\begin{aligned} \left(\frac{2}{b-1} - \frac{a}{b^2-2b+1} + 1 \right) \frac{1-b^2}{2b} &= \left(\frac{2}{b-1} - \frac{a}{(b-1)^2} + 1 \right) \frac{1-b^2}{2b} = \\ &= \left(\frac{2b-2-a+b^2-2b+1}{(b-1)^2} \right) \cdot \frac{-(b^2-1)}{2b} = \frac{b^2-a-1}{(b-1)^2} \cdot \frac{-(b-1)(b+1)}{2b} = \\ &= \frac{-(b^2-a-1)(b+1)}{2b(b-1)} = \frac{(a+1-b^2)(b+1)}{2b(b-1)} \end{aligned}$$

$$\begin{aligned} \left(\left(-\frac{3}{2} \right)^6 : \left(\frac{3}{2} \right)^9 \cdot \left(\frac{9}{2} \right)^2 \right)^{-1} &= \left(\left(\frac{3}{2} \right)^6 : \left(\frac{3}{2} \right)^9 \cdot \left(\frac{9}{2} \right)^2 \right)^{-1} = \left(\left(\frac{3}{2} \right)^{-3} \cdot \left(\frac{9}{2} \right)^2 \right)^{-1} = \left(\left(\frac{2}{3} \right)^3 \cdot \left(\frac{9}{2} \right)^2 \right)^{-1} = \\ &= \left(\frac{2^3 \cdot 3^4}{3^3 \cdot 2^2} \right)^{-1} = (2 \cdot 3)^{-1} = 6^{-1} = \frac{1}{6} \end{aligned}$$

$$\begin{aligned} \left(\frac{2}{a-1} - \frac{a}{a^2-2a+1} + 1 \right) \frac{1-a^2}{2a} &= \left(\frac{2}{a-1} - \frac{a}{(a-1)^2} + 1 \right) \frac{1-a^2}{2a} = \\ &= \left(\frac{2a-2-a+(a-1)^2}{(a-1)^2} \right) \cdot \frac{-(a^2-1)}{2a} = \frac{2a-2-a+a^2-2a+1}{(a-1)^2} \cdot \frac{-(a-1)(a+1)}{2a} = \\ &= \frac{a^2-a-1}{(a-1)^2} \cdot \frac{-(a-1)(a+1)}{2a} = \frac{a^2-a-1}{(a-1)} \cdot \frac{-(a+1)}{2a} = \frac{-(a^2-a-1)(a+1)}{2a(a-1)} = \frac{(a+1-a^2)(a+1)}{2a(a-1)} \end{aligned}$$