ⓐ $\dfrac{27^{\frac{1}{3}} \cdot 27^{\frac{5}{3}}}{27^3} = \dfrac{27^{\frac{1}{3}+\frac{5}{3}}}{27^3} = \dfrac{27^{\frac{6}{3}}}{27^3}$

$= \dfrac{27^2}{27^3} = 27^{2-3} = 27^{-1} = \boxed{\dfrac{1}{27}}$

ⓑ $81^{\frac{5}{4}} \cdot 4^{-\frac{3}{2}} = \left(81^{\frac{1}{4}}\right)^5 \cdot \dfrac{1}{4^{3/2}}$

$3^5 \cdot \dfrac{1}{\left(4^{\frac{1}{2}}\right)^3} = \dfrac{243}{2^3} = \boxed{\dfrac{243}{8}}$

ⓒ $6y^{\frac{2}{3}} \cdot 2y^{\frac{1}{2}} = 6\cdot2\, y^{\frac{2}{3}} y^{\frac{1}{2}}$

$= 12\, y^{\frac{2}{3}+\frac{1}{2}}$

$= \boxed{12\, y^{\frac{7}{6}}}$

$\left(\dfrac{2}{2}\right)\dfrac{2}{3} + \dfrac{1}{2}\left(\dfrac{3}{3}\right)$

$\dfrac{4}{6} + \dfrac{3}{6}$

$\dfrac{7}{6}$

d) $\left(\dfrac{3m^{\frac{5}{6}}}{y^{3/4}}\right)^2 \left(\dfrac{8y^3}{m^6}\right)^{\frac{2}{3}}$

$= \left(\dfrac{3^2 m^{\frac{10}{6}}}{y^{\frac{6}{4}}}\right)\left(\dfrac{8^{\frac{2}{3}} y^{\frac{6}{3}}}{m^{\frac{12}{3}}}\right)$

$= \dfrac{9 \cdot m^{\frac{5}{3} - \frac{12}{3}} \cdot \left(8^{\frac{1}{3}}\right)^2 y^2}{y^{3/2}}$

$= 9 m^{-\frac{7}{3}} \cdot 4 \cdot y^{2 - \frac{3}{2}} \qquad = \boxed{\dfrac{36 \, y^{\frac{1}{2}}}{m^{\frac{7}{3}}}}$

e) $m^{\frac{2}{3}}\left(m^{\frac{7}{3}} + 2m^{\frac{1}{3}}\right)$

$= m^{\frac{2}{3} + \frac{7}{3}} + 2m^{\frac{2}{3} + \frac{1}{3}}$

$= m^{\frac{9}{3}} + 2m^{\frac{3}{3}}$

$= \boxed{m^3 + 2m}$