4. $\sqrt[3]{xy} = y^4 - 7xy$

$\frac{d}{dx}\left[(xy)^{\frac{1}{3}}\right] = \frac{d}{dx}(y^4) + \frac{d}{dx}(-7xy)$ $\quad P'=-7,\ Q'=1\cdot y'$

$\frac{1}{3}(xy)^{\frac{1}{3}-1}\cdot\frac{d}{dx}(xy) = 4y^3y' + (-7)y + (-7x)y'$ $\quad P'Q+PQ'$

$P'=1,\ Q'=1\cdot y'$, $P'Q+PQ'$

$\frac{1}{3}(xy)^{-\frac{2}{3}}\cdot(1\cdot y + x\cdot y') = 4y^3y' - 7y - 7xy'$

$\frac{1}{3(xy)^{2/3}}(y+xy') = 4y^3y' - 7y - 7xy'$

$\frac{y}{3(xy)^{2/3}} + \frac{xy'}{3(xy)^{2/3}} = 4y^3y' - 7y - 7xy'$

$3(xy)^{2/3}\left(\frac{y}{3(xy)^{2/3}}\right) + 3(xy)^{2/3}\left(\frac{xy'}{3(xy)^{2/3}}\right) = 4y^3y'\cdot 3(xy)^{2/3} - 7y\cdot 3(xy)^{2/3} - 7xy'\cdot 3(xy)^{2/3}$

$y + xy' = 12y^3y'(xy)^{2/3} - 21y(xy)^{2/3} - 21xy'(xy)^{2/3}$

$xy' - 12y^3y'(xy)^{2/3} + 21xy'(xy)^{2/3} = -y - 21y(xy)^{2/3}$

$y'\left[x - 12y^3(xy)^{2/3} + 21x(xy)^{2/3}\right] = -y - 21y(xy)^{2/3}$

$$y' = \frac{-y - 21y(xy)^{2/3}}{x - 12y^3(xy)^{2/3} + 21x(xy)^{2/3}}$$

RECALL $\sqrt[3]{xy} = y^4 - 7xy$

$$y' = \frac{-y - 21y\left(\sqrt[3]{xy}\right)^2}{x - 12y^3\left(\sqrt[3]{xy}\right)^2 + 21x\left(\sqrt[3]{xy}\right)^2}$$

$$= \frac{-y - 21y(y^4 - 7xy)^2}{x - 12y^3(y^4 - 7xy)^2 + 21x(y^4 - 7xy)^2}$$