$$\frac{dy}{dx} + {}^{x}p\, y = {}^{x}q\, y^{\alpha}: \quad \alpha \neq 0{:}1$$

$${}^{x}z \;=\; {}^{x}y^{1\,-\,\alpha} \Longrightarrow \frac{dz}{dx} + (1-\alpha)\; {}^{x}p\; {}^{x}z \;=\; (1-\alpha)\; {}^{x}q \;\; \text{lin}$$

$$\frac{dz}{dx} = (1-\alpha)\; y^{-\alpha}\,\frac{dy}{dx} = (1-\alpha)\; y^{-\alpha}\,\left({}^{x}qy^{\alpha} - {}^{x}py\right) = (1-\alpha)\left({}^{x}q - {}^{x}pz\right)$$

$$\begin{cases} \underline{y} + y = y^{2} \\ y\,(0) = 4 \end{cases} \Longrightarrow y = \overbrace{1 + Ce^{x}}^{-1} \underset{y\,(0)\,=\,4}{\Longrightarrow} C = -3/4$$

$$\begin{cases} \underline{y} + \dfrac{y}{x} = xy^{2} \\ y\,(1) = \;1/2 \end{cases} \Longrightarrow y = \overbrace{3x - x^{2}}^{-1}$$

$$\alpha = 2: \quad z = \frac{1}{y} \Longrightarrow \underline{z} - \frac{z}{x} = -x \Longrightarrow z = x\int_{dx} \frac{-x}{x} = -\,x^{2} + Cx \underset{z\,(1)\,=\,2}{\Longrightarrow} C = 3$$

$$x^{2}\,dy + \left(y^{2} - xy\right)dx = 0 \Longrightarrow$$

$$\underline{y} - \frac{y}{x} = -\frac{y^{2}}{x^{2}} \Longrightarrow z = \frac{1}{y} \Longrightarrow \underline{z} + \frac{z}{x} = \frac{1}{x^{2}}$$

$$\begin{cases} 3\underline{y} + y = \underbrace{1 - 2x}\,y^{4} \\ y\,(0) = \;1/2 \end{cases} \Longrightarrow y = \left(9e^{x} - 2x - 1\right)^{-1/3}$$

$$\underline{y} + \frac{y}{3} = \frac{1-2x}{3}\,y^{4} \Longrightarrow z = \frac{1}{y^{3}} \Longrightarrow \underline{z} - z = 2x - 1 \Longrightarrow z = e^{x}\int_{dx} \frac{2x-1}{e^{x}} = -2x - 1 + C\,e^{x} \underset{z\,(0)\,=\,8}{\Longrightarrow} C = 9$$

$$\begin{cases} \underline{y} - y^2 e^{2x} = -y \\ y\left(0\right) = 0 \end{cases}$$

$$\begin{cases} xy\underline{y} - y^2 = x \\ y\left(1\right) = 1 \end{cases}$$