$y' = 3\sqrt[3]{y^2}$, где $y(2)=0$

$$\frac{dy}{dx} = 3y^{\frac{2}{3}}$$

$$\frac{1}{dx} = \frac{3y^{\frac{2}{3}}}{dy}$$

$$3dx = \frac{dy}{y^{\frac{2}{3}}}$$

$$3\int dx = \int\frac{dy}{y^{\frac{2}{3}}}$$

$$3x = \frac{y^{-\frac{2}{3}+1}}{-\frac{2}{3}+1} + C$$

$$3x = 3y^{\frac{1}{3}} + C$$

$$x^3 = y + C$$

$C = 8$

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$(x^2-1)y' + 2xy^2 = 0$, где $y(0)=1$

$$\frac{dy}{dx} = -\frac{2xy^2}{x^2-1}$$

$$\int y^{-2}dy = -\int\frac{2x\,dx}{x^2-1} \quad \Big| \; (x^2-1)' = 2x$$

$$-y^{-1} = -\int\frac{d(x^2-1)}{x^2-1}$$

$$-\frac{1}{y} = -\ln|x^2-1| + C$$

$$\ln|x^2-1| - \frac{1}{y} = C$$

$$\ln|0^2-1| = C+1$$

$$1 = e^{C+1}$$

$$1 = e^C\cdot e^1$$

$$1 = Ce$$

$C = \frac{1}{e}$

$\sqrt{y^2+1}\,dx = xy\,dy$

$$\int\frac{dx}{x} = \int\frac{y\,dy}{\sqrt{y^2+1}} \quad \Big| \; (y^2+1)' = 2y$$

$$\frac{1}{2}\int\frac{2y\,dy}{\sqrt{y^2+1}}$$

$$\overset{\times 2}{\ln|x|} = \frac{1}{2}\sqrt{y^2+1} \overset{\times 2}{+C}$$

$$2x = e^{\sqrt{y^2+1}+C}$$

$2x = Ce^{\sqrt{y^2+1}}$

$(x+2y)dx - xdy = 0$

$$x + 2y = \frac{x\,dy}{dx}$$

$$1\cancel{\frac{x}{x}} + \frac{2y}{x} = y' \quad \Big| \; \begin{array}{l} y = z\cdot x \\ y' = z'\cdot x + z \end{array}$$

$$1 + \cancel{2}z = \frac{dz}{dx}\cdot x \cancel{+z}$$

$$\frac{1+z}{x} = \frac{dz}{dx}$$

$$\int\frac{dx}{x} = \int\frac{dz}{1+z}$$

$$\ln|x| = \ln|1+z| + \ln C \Rightarrow$$

$$\Rightarrow \ln|1+z| = \ln|x| + \ln C$$

$$z = Cx - 1$$

$$\frac{y}{x} = Cx - 1$$

$y = Cx^2 - x$

$$x^3 y' = y(2x^2 - y^2)$$

$$y' = -\frac{y^3 - 2x^2 y}{x^3} \qquad \Bigg| \quad z = \frac{y}{x}$$

$$y = z \cdot x$$

$$z'x + z = -\frac{z^3\cancel{x^3} - 2\cancel{x^2} z \cancel{x}}{\cancel{x^3}} \qquad \Big| \quad y' = z'x + z$$

$$z'x + \cancel{z} + z^3 - \cancel{2}z = 0$$

$$\frac{dz}{dx} x + z^3 - z = 0$$

$$\frac{z^3 - z}{dz} = \frac{-x}{dx}$$

$$\int \frac{dz}{z^3 - z} = -\int \frac{dx}{x}$$

$$\cancel{\int \frac{dz}{(x-1)(x+1)x} = C - \ln|x|}$$

$$\int \frac{dz}{(z-1)(z+1)z} = C - \ln|x|$$

$$\int \left(\frac{1}{2(z+1)} - \frac{1}{z} + \frac{1}{2(z-1)} \right) dz$$

$$\frac{1}{2}\int \frac{dz}{z+1} - \int \frac{dz}{z} + \frac{1}{2}\int \frac{dz}{z-1}$$

$$\frac{\ln|z+1|}{2} + \frac{\ln|z-1|}{2} - \ln|z| = C - \ln|x|$$

$$\ln|\sqrt{z+1}| + \ln|\sqrt{z-1}| - \ln|z| = \ln C - \ln|x|$$

$$\ln|\sqrt{z+1}| + \ln|\sqrt{z-1}| - \ln|z| + \ln|x| = \ln C$$

$$C = \frac{\sqrt{z+1}\,\sqrt{z-1}\,x}{z}$$

$$C = \frac{\sqrt{\left(\frac{y}{x}\right)^2 - 1}\;x}{\frac{y}{x}}$$

$$C = \frac{\sqrt{\left(\frac{y}{x}\right)^2 - 1}\;x^2}{y}$$

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