4.32

1 4.32, §1 Asked

Solve:

$$-\frac{2y}{t^3}\,\mathrm{d}t + \frac{1}{t^2}\,\mathrm{d}y = 0$$

2 4.32, §2 Solution

$$-\frac{2y}{t^3}\,\mathrm{d}t + \frac{1}{t^2}\,\mathrm{d}y = 0$$

Check for exactness:

$$\frac{\partial g}{\partial t} \stackrel{?}{=} -\frac{2y}{t^3} \qquad \frac{\partial g}{\partial y} \stackrel{?}{=} \frac{1}{t^2}$$

$$\frac{\partial}{\partial y}\left(-\frac{2y}{t^3}\right) \stackrel{?}{=} \frac{\partial}{\partial t}\left(\frac{1}{t^2}\right)$$

$$-\frac{2}{t^3} \stackrel{!}{=} -\frac{2}{t^3}$$

Integrate the easiest equation first:

$$\frac{\partial g}{\partial y} = \frac{1}{t^2} \quad \Longrightarrow \quad g = \frac{y}{t^2} + C(t)$$

Put in the other equation:

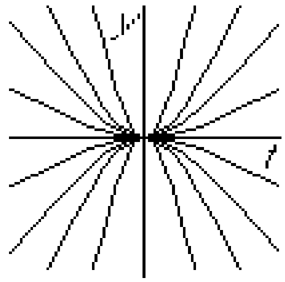
$$\frac{\partial g}{\partial t} = -\frac{2y}{t^3} + C' = -\frac{2y}{t^3}$$

$$g = \frac{y}{t^2} + C$$

Solution of the O.D.E.:

$$\frac{y}{t^2} + C = C_2$$

$$y = Dt^2$$



In real life, you would have

$$-\frac{2y}{t}\,\mathrm{d}t + \,\mathrm{d}y = 0$$