Quiz #4

MATH 126 — Calculus II
Friday, Sept 18

Please print your name:

Problem 1. Solve the initial value problem $\frac{\mathrm{d}y}{\mathrm{d}x} = xy, \;\; y(0) = 7.$ [Because of the initial condition, you may assume $y > 0$.]

Solution. We separate variables,

$$\frac{1}{y}\,\mathrm{d}y = x\,\mathrm{d}x$$

and integrate

$$\int \frac{1}{y}\,\mathrm{d}y = \int x\,\mathrm{d}x$$

to find

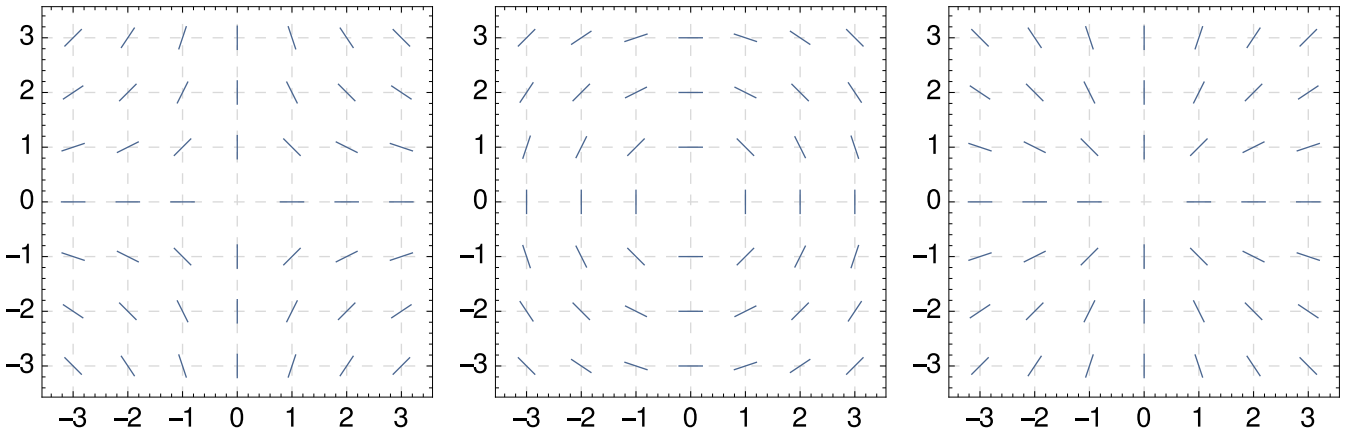
$$\ln|y| = \frac{1}{2}x^2 + C.$$

Plugging in $y = 7$ and $x = 0$, we find $C = \ln(7)$. Since $y > 0$, we exponentiate to find

$$y(x) = e^{x^2/2 + \ln(7)} = 7e^{x^2/2}.$$

□

Problem 2. (Bonus) For a small bonus, select the slope field which belongs to $\frac{\mathrm{d}y}{\mathrm{d}x} = -\frac{y}{x}$.



Solution. The first slope field belongs to $\frac{\mathrm{d}y}{\mathrm{d}x} = -\frac{y}{x}$.

[The second corresponds to $\frac{\mathrm{d}y}{\mathrm{d}x} = -\frac{x}{y}$, and the third to $\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{y}{x}$.] □

Armin Straub
straub@southalabama.edu