# Math 1B, Quiz 9

## Monday, April 13

1. (2 pts) Show that $y = 1 + 3x$ is a solution to the differential equation $y' = (y-1)/x$.

$$y' = (1+3x)' = 3 = (1+3x-1)/x = (y-1)/x$$

2. (2 pts) Show that $y = e^{x^2-x}$ is a solution to the differential equation $y' = 2xy - y$.
Check from both ends, use $=^?$ to show that we are trying to prove equality but have not yet done so.

$$\begin{aligned} y' &=^? 2xy - y \\ (e^{x^2-x})' &=^? 2x(e^{x^2-x}) - e^{x^2-x} \\ (2x-1)e^{x^2-x} &= 2xe^{x^2-x} - e^{x^2-x} \end{aligned}$$

3. (3 pts) Find the solution to the differential equation $y' = x/y$, given $y(0) = 1$.

$$\begin{aligned} \frac{dy}{dx} &= x/y \\ \int y\,dy &= \int x\,dx \\ y^2/2 &= x^2/2 + c \\ y &= \pm\sqrt{k + x^2} \\ y &= \sqrt{1+x^2} \end{aligned}$$

4. (3 pts) Match each of the differential equations with one of the direction fields shown below:

   (a) $y' = x^2 + y^2 - 1$

   (b) $y' = 3x + y$

   (c) $y' = x - 3y$

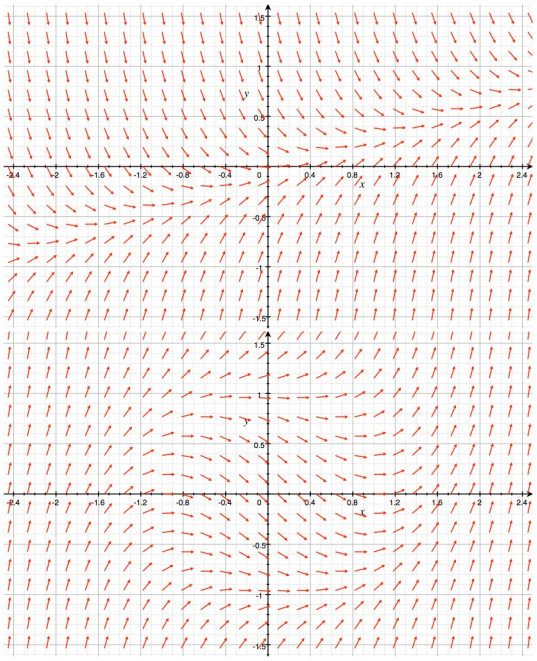
   (d) $y' = xy$

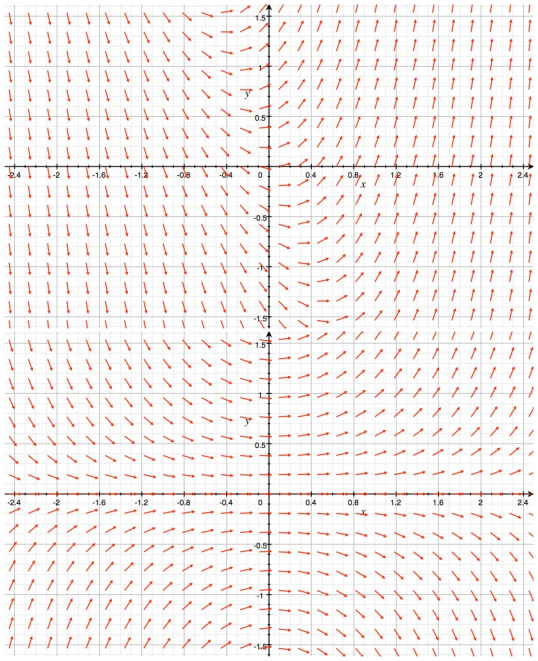
Top left: C

Top right: B

Bottom left: A

Bottom right: D





## Extra Credit

1. (Zero points) If you pick an answer to this question at random, what is the chance that you will be correct?

   If you assume that you might pick any of the answers with equal probability, then there is no solution.

   If you pick (a) and (d) each with 25% probability and (b) with 50% probability, then (b) is the correct answer.

   (a) 25%

   (b) 50%

   (c) 0%

   (d) 25%