Math 110, Spring 2016
HWK08 due Mar 23

1. In each case, decide whether the given function satisfies the differential equation or initial value problem.

   (a) Does $y(x) = xe^x + 5$ solve $y' = y + e^x - 5$?

   (b) Does $f(x) = 1 + \dfrac{1}{1+x}$ solve $f' = -\dfrac{f(x)}{1+x} + f(x) - 1$ with $f(0) = 0$?

   (c) Does $z = e^{\sqrt{z}-\sqrt{t}}$ solve $\dfrac{dz}{dt} = \dfrac{2z}{t}$ with $z(1) = 0$?

2. Write initial value problems (a differential equation with an initial condition) for each of these integral equations. The hard part here is applying the Fundamental Theorem of Calculus to determine the derivative of the integral expression. If you are having trouble with this, please review page 330 of the textbook (this is why we assigned MML problems from this section).

   (a) $A(t) = \int_0^t (2 - A(s))\,ds$

   (b) $f(x) = \int_{-2}^x tf(t)\,dt$

   (c) $y(t) = 3 - \int_2^t \frac{\sin(\pi s)}{y(s)^2}\,ds$

   (d) $g(x) = \frac{-x^2}{2} + \int_0^x g(t)\,dt$

   (e) $W(t) = \int_1^{t^2} W(\sqrt{s})\,ds$

3. Match each of the differential equations below with the corresponding slope field in the next page.

   (a) $\dfrac{dy}{dx} = e^{(x-y)}$

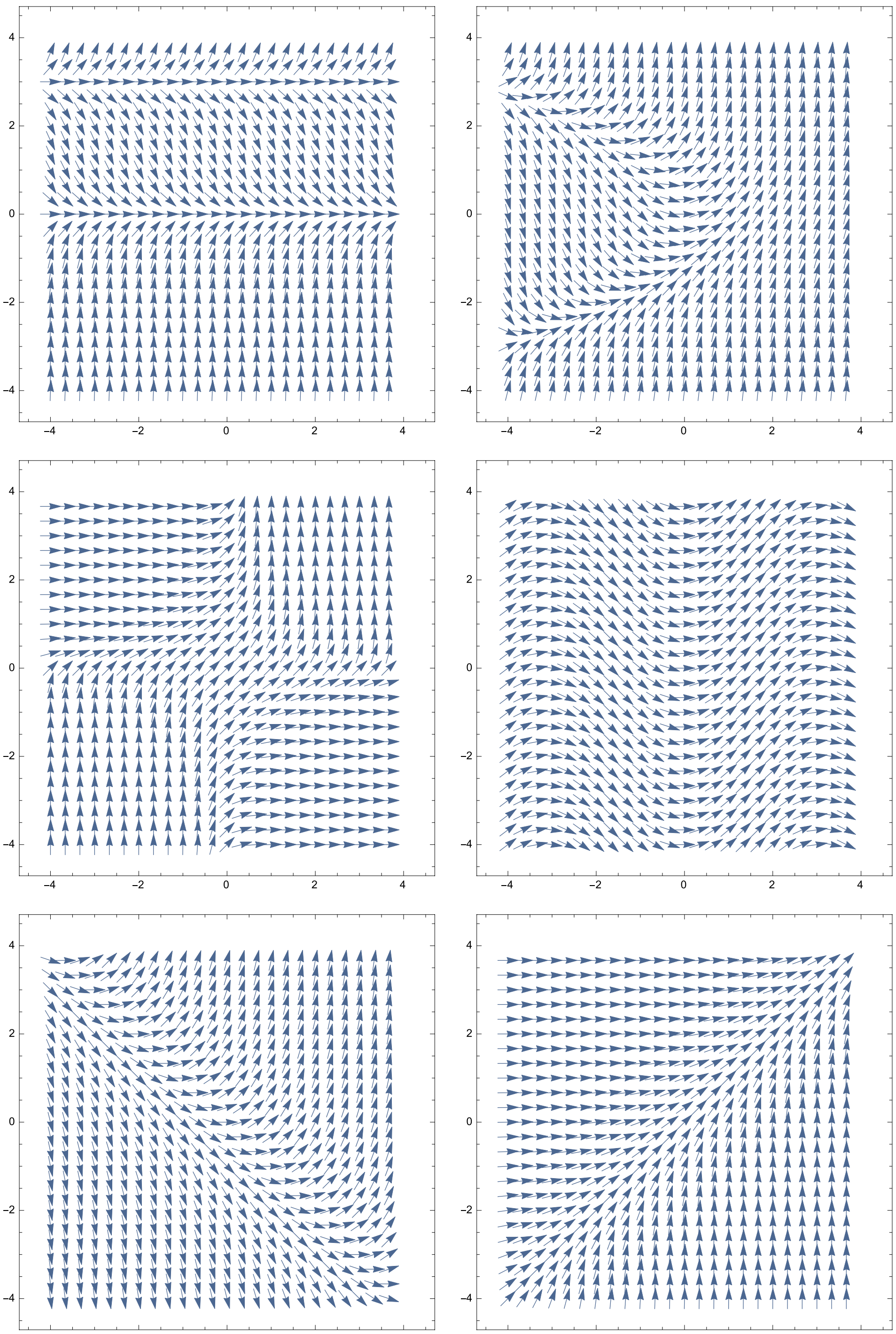
   (b) $\dfrac{dy}{dx} = e^{xy}$

   (c) $\dfrac{dy}{dx} = x + \dfrac{1}{2}y^2$

   (d) $\dfrac{dy}{dx} = \sin(x)$

   (e) $\dfrac{dy}{dx} = x + y$

   (f) $\dfrac{dy}{dx} = y(y-3)$



4. (a) Use Euler's method (and your calculator!) to estimate $y(3)$ if y satisfies the initial value problem

$$\frac{dy}{dx} = xy - y^2/2 \ ; \quad y(0) = 0.7\,.$$

Do the computation twice, with $\Delta x = 1$ and $\Delta x = 1/2$.

(b) Draw a slope field for the above equation; include the trajectory $(x, y(x))$ passing through the initial point $(0, 0.7)$.