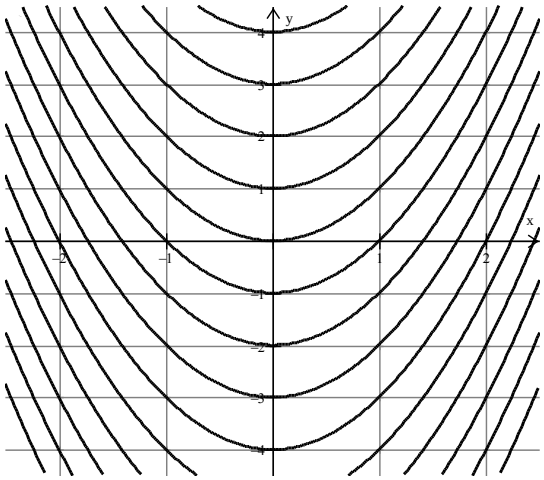
AP Calculus AB

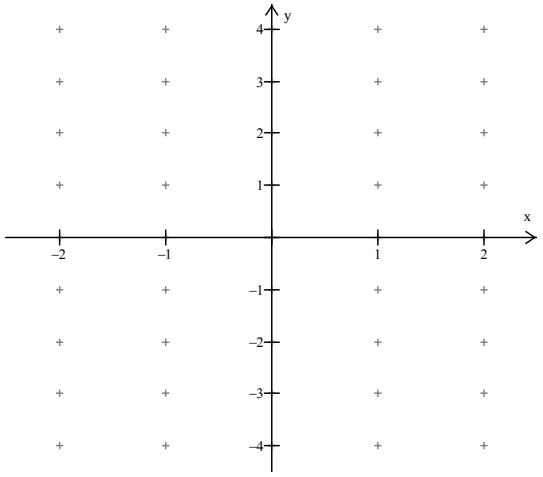
6.2 – Introduction to Slope Fields

A. What is a *Slope Field*?

Consider the differential equation: $\frac{dy}{dx} = 2x$ Solution: $y =$

The solution set is a _____ ____ _____, or _____ of _____.





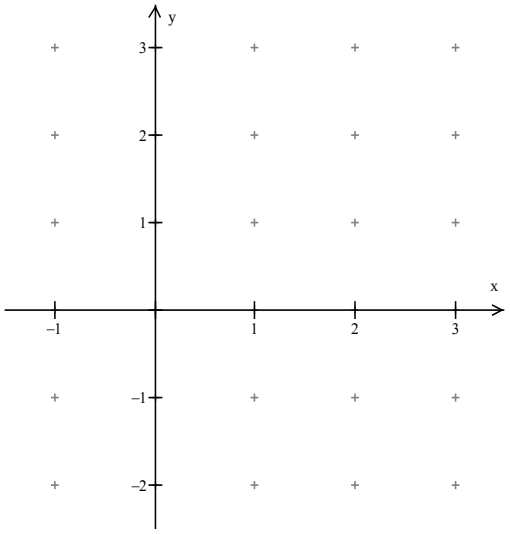
Slope fields are _____

_____

B. How to sketch a *Slope Field* directly from a differential equation.

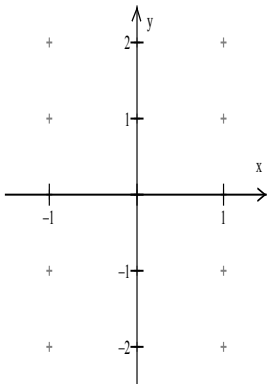
First, let's learn how to sketch individual *isoclines* with the following specific slopes:

$A = 1,\ B = -1,\ C = 2,\ D = -2,\ E = \frac{1}{2},\ F = \frac{1}{4}$

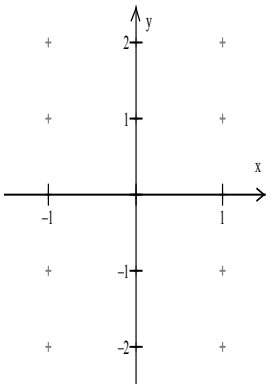


Now let's sketch some simple complete slope fields for the following DE:

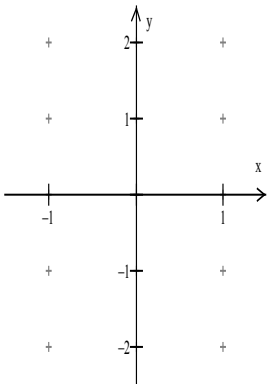
1. $\frac{dy}{dx} = 2$



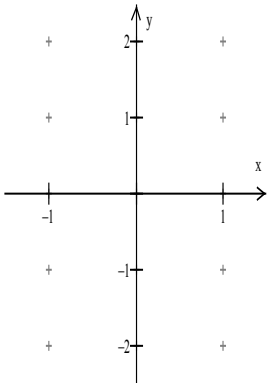
2. $\frac{dy}{dx} = y$



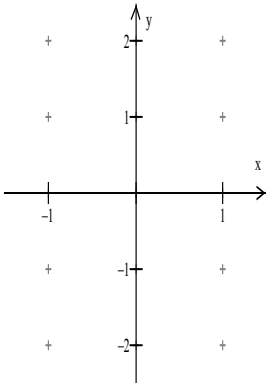
3. $\frac{dy}{dx} = x + 1$

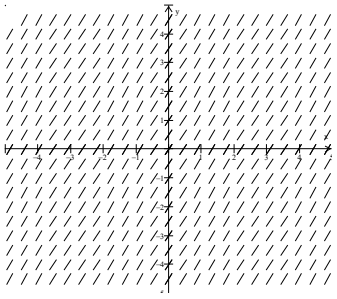


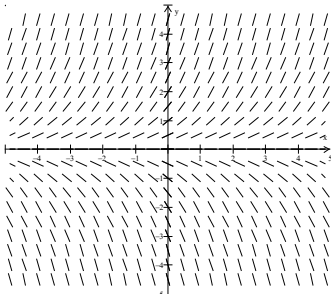
4. $\frac{dy}{dx} = \frac{1+y}{x}$

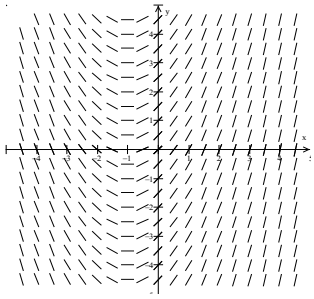


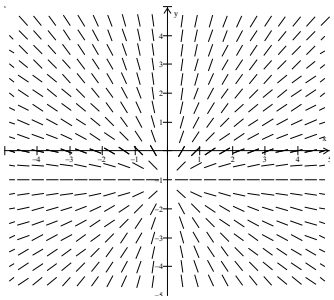
5. $\frac{dy}{dx} = x - y$

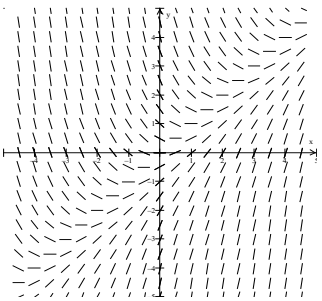












C. How to match a Slope Field to its corresponding Differential Equation

Some tips:

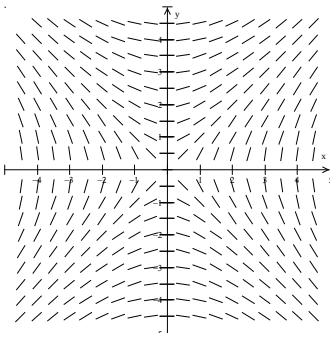
1. If DE is a function of only x, then the slopes of isoclines are _____ on each _____.
2. If DE is a function of only y, then the slopes of isoclines are _____ on each _____.
3. If DE is a function of x and y, check what condition makes the slope zero.
4. Check what values of x, y that make the denominator equal to zero → slope will be _____.
5. Check what happens to the slope when x or y gets large.
6. Use the DE to determine in which quadrants the slopes should be + or -.

Match the DE with it's SF:

A. $\frac{dy}{dx} = \frac{x}{y}$ B. $\frac{dy}{dx} = e^x$ C. $\frac{dy}{dx} = y(2-y)$ D. $\frac{dy}{dx} = 2x + y$

E. $\frac{dy}{dx} = \sin x$ F. $\frac{dy}{dx} = 2 - x$ G. $\frac{dy}{dx} = y - 1$

I.



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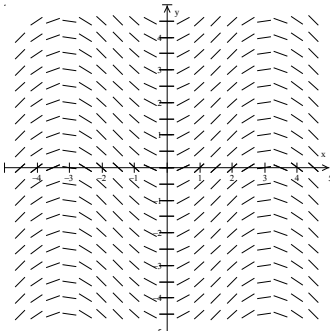
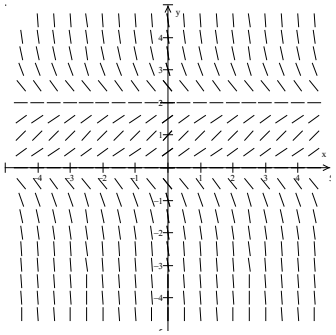


III.



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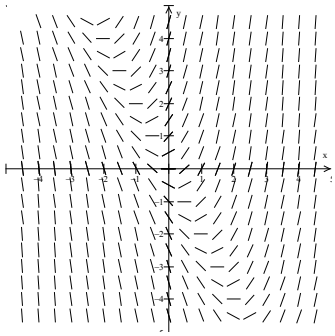

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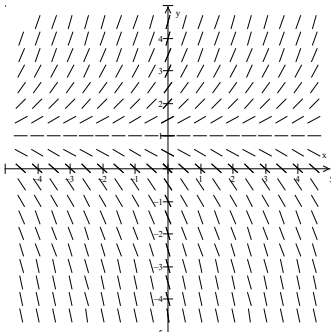

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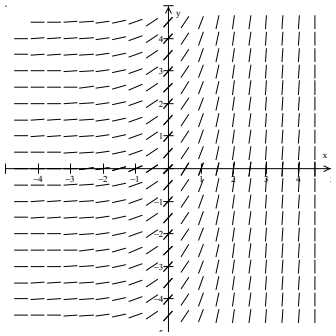

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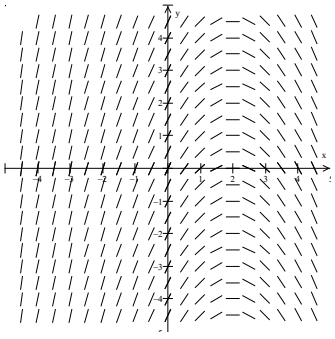
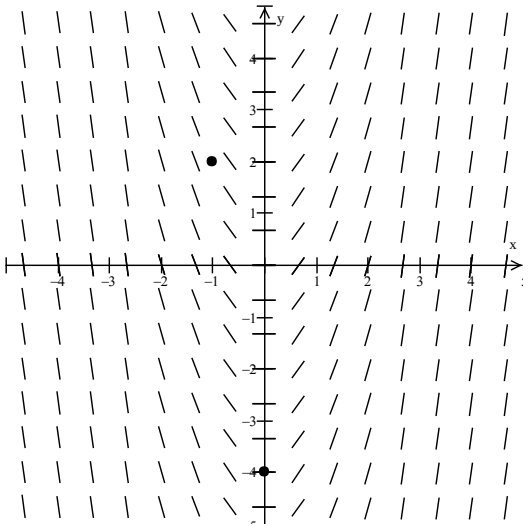


D. How to sketch a specific Solution Curve on a Slope Field.

Sketch the curve passing through the given point on the Slope Field.

A.



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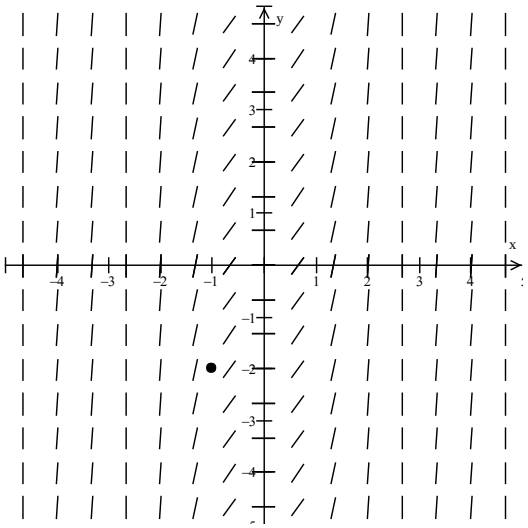

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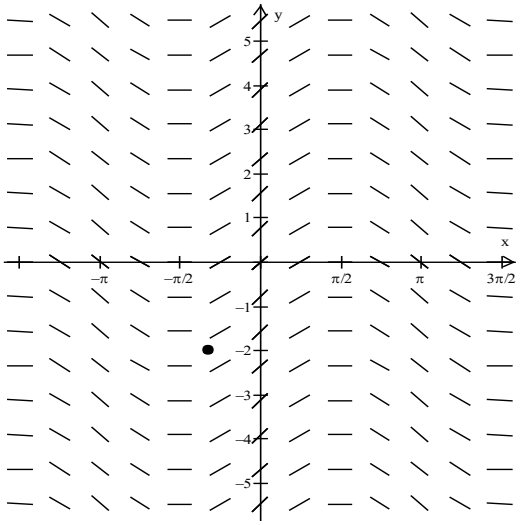
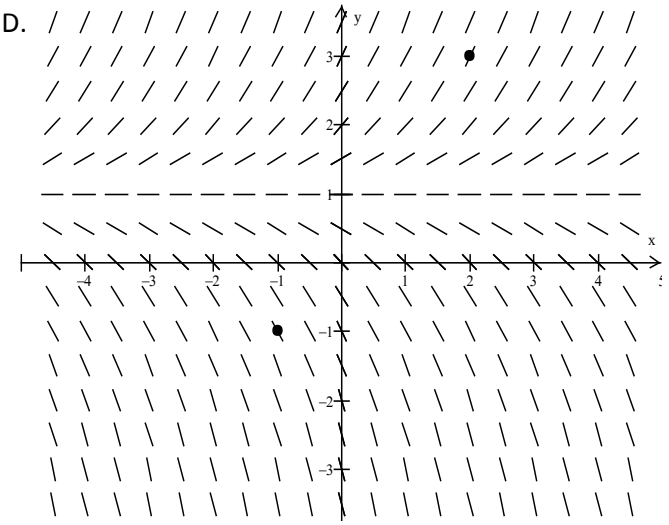


D.



E.