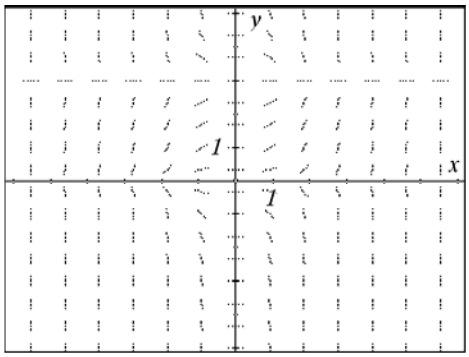
Part 1 – Introducing Slope Fields

1. Describe your observations when you grab and move the initial condition point on the slope field for $\frac{dy}{dx} = \frac{1}{2}x^2\left(3y - y^2\right)$ on page 1.3.

2. The slope field was based on the differential equation $\frac{dy}{dx} = \frac{1}{2}x^2\left(3y - y^2\right)$. Confirm the slope of the short segments on the slope field by finding the value of the slope as (–1, –1), (0, –3), (1, 1), (1, –1). Circle the slope at that point.

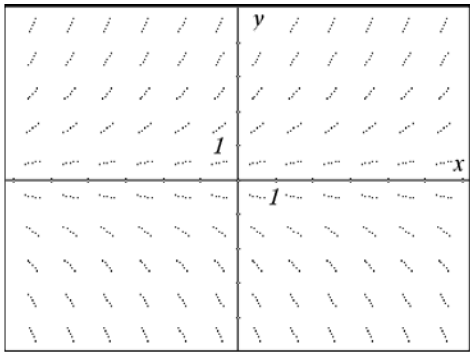


$\left.\frac{dy}{dx}\right|_{\substack{x=-1\\y=-1}} =$ $\left.\frac{dy}{dx}\right|_{\substack{x=0\\y=-3}} =$

$\left.\frac{dy}{dx}\right|_{\substack{x=1\\y=1}} =$ $\left.\frac{dy}{dx}\right|_{\substack{x=1\\y=-1}} =$

3. For the differential equation $\frac{dy}{dx} = x + 1$, when is the slope of the tangent equal to zero?

4. The slope field to the right depends on what variable(s)? What differential equation could produce this slope field?



Part 2 – DE matching activity

Match the differential equation to its slope field on the next page of this worksheet. Use the strategies developed above to identifying the slope field for a differential equation.

You can check your answers with the slope field on page 4.2. of the TI-Nspire file. Pages 3.1-3.5 provide a tutorial for using the built-in "Graph Type" of "Differential Equation." On the TI-Nspire, slope fields can be done on a *Scratchpad Graph* or on a *Graph* application of your current document. Press **menu** > **Graph Type** > **Differential Equation**. Enter the DE.

You can change the y1 to a different letter, like *P* for population. However, the independent variable will need to be *x*. For example, dP/dt = *P* + *t* will be entered as y1'=y1+x.

Match the following differential equations with their slope field. Check using page 4.2.

1. ___ $\frac{dy}{dx} = 0.3x^2$

2. ___ $\frac{dy}{dx} = 1 - y$

3. ___ $\frac{dy}{dx} = \cos x$

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

5. ___ $\frac{dy}{dx} = 2x$

6. ___ $\frac{dy}{dx} = y(3 - y)$

7. ___ $\frac{dy}{dx} = x^2 + y^2$

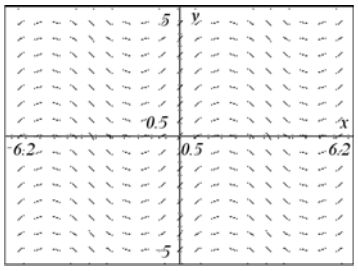
8. ___ $\frac{dy}{dx} = \sin x$

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

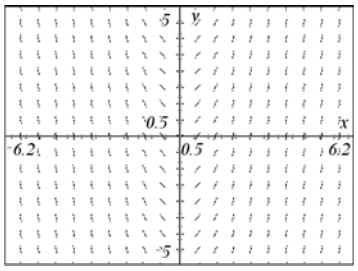
10. ___ $\frac{dy}{dx} = -\frac{x}{y}$

11. ___ $\frac{dy}{dx} = \frac{x}{y}$

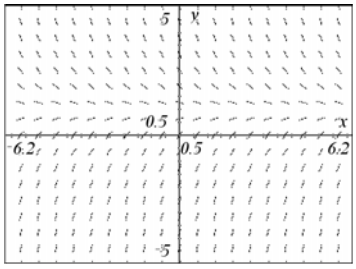
A.



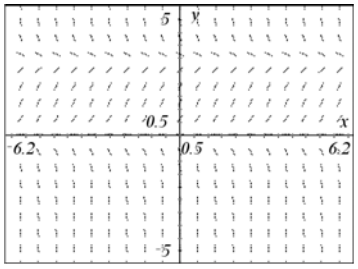
B.



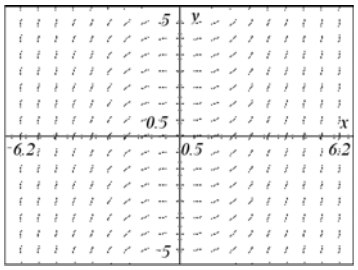
C.



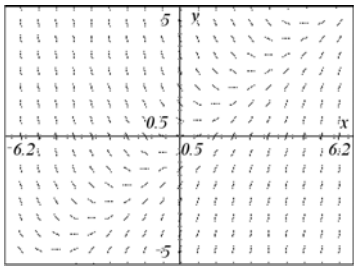
D.



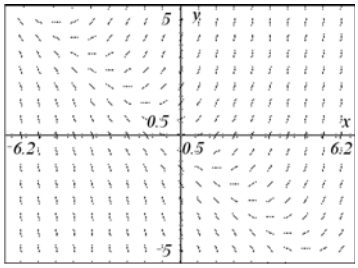
E.



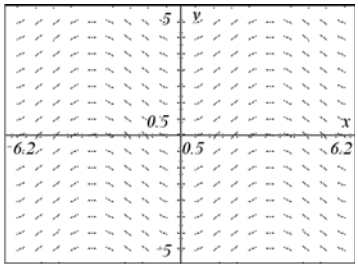
F.



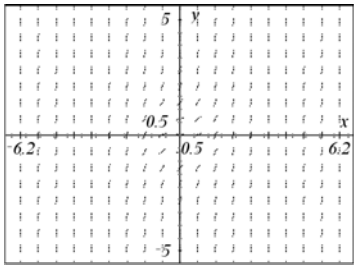
G.



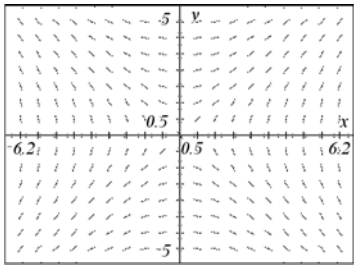
H.



I.



J.



K.