Slope Fields Forever

defield.89t, dematch.89t

Name ________________________

Class ________________________

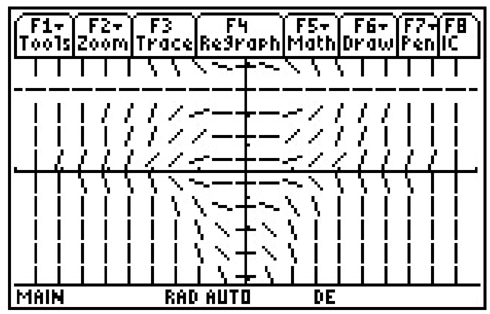
In this activity, you will explore slope fields generated by differential equations. You will explore the effects on the particular solution to a differential equation when initial conditions are changed.

Press APPS, select the *Text Editor* application, and open *defield*. Press F4 to execute each command line and read the questions or instructions.

The slope field represents the differential equation $\frac{dy}{dt} = \frac{1}{2}t^2\left(3y - y^2\right)$. Press 2nd F8 to set initial conditions for *t* and *y*, such as $t = 1$ and $y = -1$. You can press F4 to clear the particular solution(s) and display the slope field only. Use this procedure to explore the particular solutions for different initial conditions.

1. Describe your observations when the initial condition point (t, y) changes.

2. Describe the particular solutions when $t = 0$.



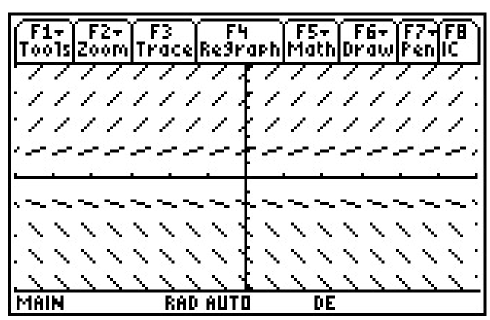
The slope field shown is based on the differential equation $\frac{dy}{dt} = \frac{1}{2}t^2\left(3y - y^2\right)$. Confirm the slope of the short line segments on the slope field by finding the value of the slope at (–1, –1), (0, –3), (1, 1), and (1, –1). Circle the segment nearest each point.

3. $\left.\frac{dy}{dt}\right|_{\substack{t=-1\\y=-1}} =$ **4.** $\left.\frac{dy}{dt}\right|_{\substack{t=0\\y=-3}} =$

5. $\left.\frac{dy}{dt}\right|_{\substack{t=1\\y=1}} =$ **6.** $\left.\frac{dy}{dt}\right|_{\substack{t=1\\y=-1}} =$

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

8. The slope field at the right depends on what variable(s)? Which differential equation could produce this slope field: $\frac{dy}{dt} = y^2$, $\frac{dy}{dt} = t + 1$, or $\frac{dy}{dt} = \frac{1}{2}y$? Explain.



Match each DE with its slope field. Check your answers using the script file *dematch.89t*.

1. ____ $\dfrac{dy}{dt} = 0.3t^2$

2. ____ $\dfrac{dy}{dt} = 1 - y$

3. ____ $\dfrac{dy}{dt} = \cos t$

4. ____ $\dfrac{dy}{dt} = t + y$

5. ____ $\dfrac{dy}{dt} = 2t$

6. ____ $\dfrac{dy}{dt} = y(3 - y)$

7. ____ $\dfrac{dy}{dt} = t^2 + y^2$

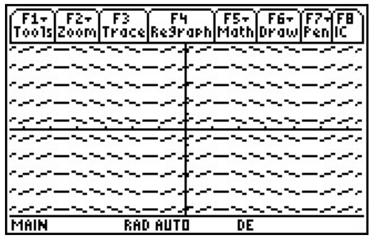
8. ____ $\dfrac{dy}{dt} = \sin t$

9. ____ $\dfrac{dy}{dt} = t - y$

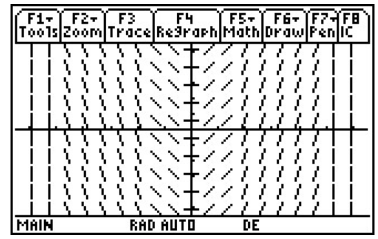
10. ____ $\dfrac{dy}{dt} = -\dfrac{t}{y}$

11. ____ $\dfrac{dy}{dt} = \dfrac{t}{y}$

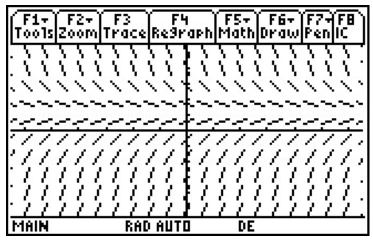
A.



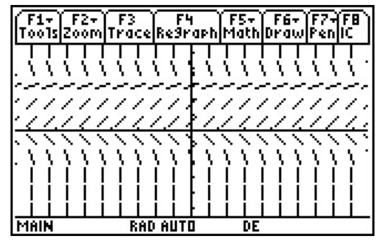
B.



C.



D.



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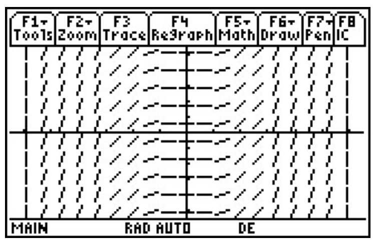

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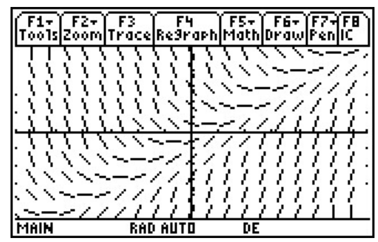

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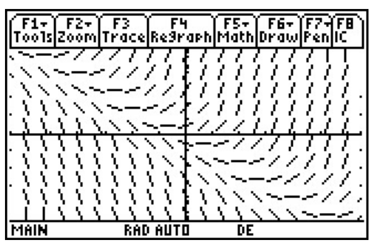

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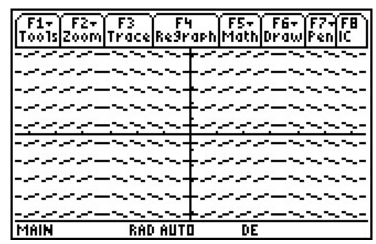
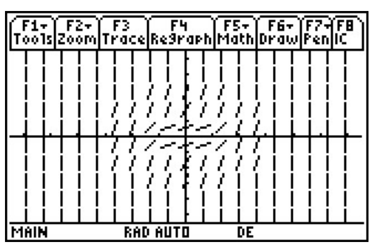
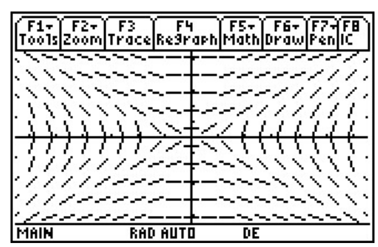


I.



J.



K.