

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 $\frac{dy}{dt} = \frac{1}{2}t^2(3y - y^2)$. 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 $\frac{dy}{dt} = \frac{1}{2}t^2(3y - y^2)$. 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.** $\frac{dy}{dt}\Big|_{\substack{t=-1\\y=-1}} =$ **4.** $\frac{dy}{dt}\Big|_{\substack{t=0\\y=-3}} =$
- **5.** $\frac{dy}{dt}\Big|_{t=1}_{y=1}$ **6.** $\frac{dy}{dt}\Big|_{t=1}_{t=1}$

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- 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.

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

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2	$\frac{dy}{dt} = 1 - y$				
3	$\frac{dy}{dt} = \cos t$	•		_	
4	$\frac{dy}{dt} = t + y$	C.	100751200m1+ace Redraph Mathlprow FenilC	D.	Tóðis 200m trácel Reárann Máth Dráw Fénlíc
5	$\frac{dy}{dt} = 2t$		MAIN RAD AUTO DE		
6	$\frac{dy}{dt} = y(3-y)$	Ε.	F1+ F2+ F3 F4 F5+ F6+ F7+F8 Too13200mTraceRe9raphMathDrawFenIC	F.	F1+ F2+ F3 Too13200m[TraceReStarh]Math]Draw[Fen][C
7	$\frac{dy}{dt} = t^2 + y^2$				
8	$\frac{dy}{dt} = \sin t$		MAIN RAD AUTO DE		MAIN RAD AUTO DE
9	$\frac{dy}{dt} = t - y$	G.	F1 F2 F3 F4 F5 F6 F7 F8 Too15/200m TraceRe3raph/Math/Draw/Pen/IC	H.	F1+ F2+ F3 Too1s200m[TraceRe3raph[Math]Draw[Pen](C
10	$\frac{dy}{dt} = -\frac{t}{y}$				
11	$\frac{dy}{dt} = \frac{t}{y}$	1		.I	MAIN RAD AUTO DE F1+ F2+ F3+ F4+ F5+ F6+ F7+ F8+
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