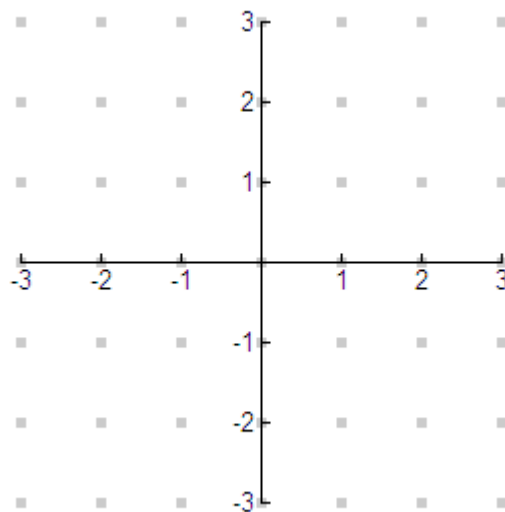


SLOPE FIELDS

A slope field is a geometric representation of a differential equation. [A visualization of a rate or a derivative]

Slope fields are drawn on the “lattice points” of a Cartesian plane.



The TI-89 poster beyond the pillar shows a slope field!

Everyone should have a handout which was written by Ms. Nancy Stephenson

Handout can also be found at:

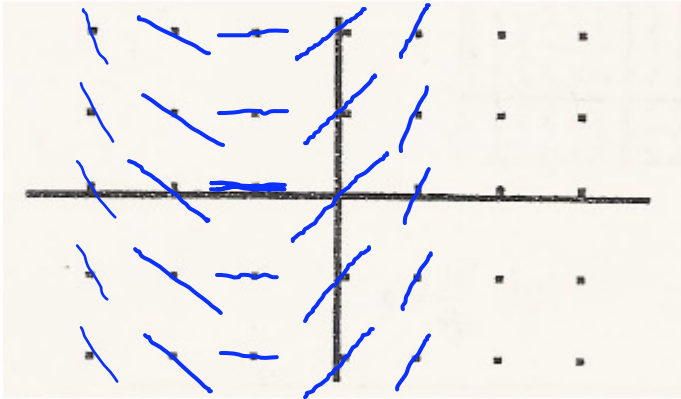
http://apcentral.collegeboard.com/apc/public/repository/ap08_calculus_slopefields_worksheet.pdf

Let's draw our first slope field. On your handout, draw the slope field for

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

$(0, 0) \frac{dy}{dx} = 1$

$(-2, 0) \frac{dy}{dx} = -1$



$(0, 1) \frac{dy}{dx} = 1$ $(1, 1) \frac{dy}{dx} = 2$

$(-1, 0) \frac{dy}{dx} = 0$ $(-3, 0) \frac{dy}{dx} = -2$

$(-1, -2) \frac{dy}{dx} = 0$

Let's keep track of our ordered pairs [lattice points] and the values of dy/dx

Note: If $\frac{dy}{dx}$ is the indeterminate form of $\frac{\text{number}}{0}$, then the segments should be vertical.

IF $\frac{dy}{dx} = \frac{0}{0}$ then Don't Draw Anything

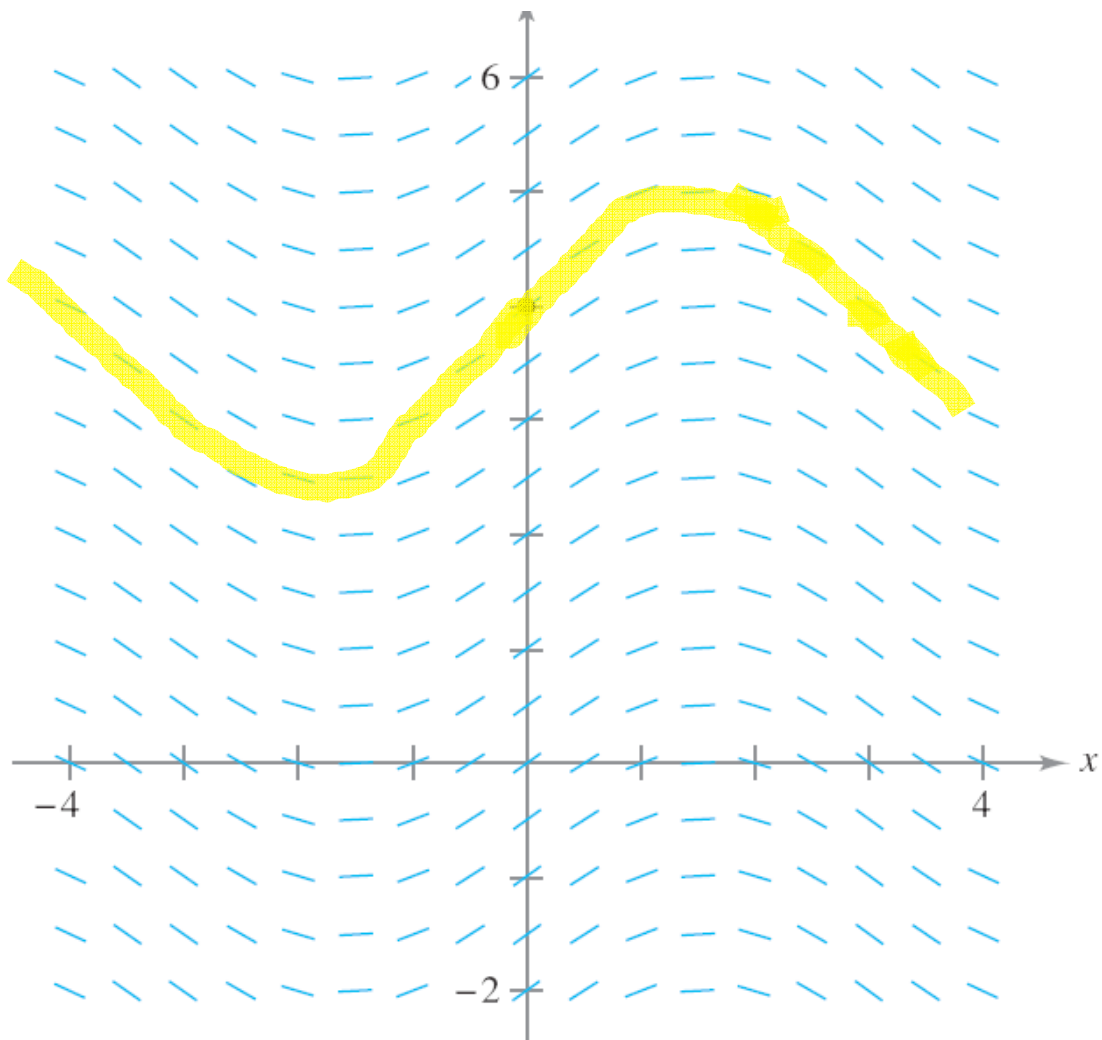
If we had a point on a particular curve, then we could sketch the curve on the slope field. See page 256.

4.1 Exercise 51 (page 256)

Instructor _____

A differential equation, a point, and a slope field are given. A *slope field* (or *direction field*) consists of line segments with slopes given by the differential equation. These line segments give a visual perspective of the slopes of the solutions of the differential equation. (a) Sketch two approximate solutions of the differential equation on the slope field, one of which passes through the indicated point. (b) Use integration to find the particular solution of the differential equation and use a graphing utility to graph the solution. Compare the result with the sketches in part (a).

$$\frac{dy}{dx} = \cos x, \quad (0, 4)$$

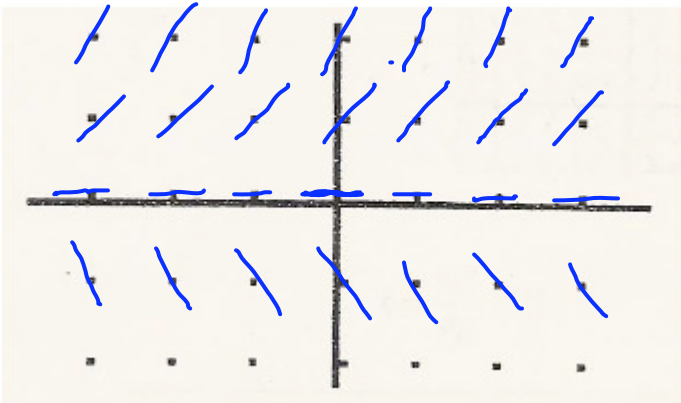


Now let's consider the slope field for

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

$$(0,0) \frac{dy}{dx} = 0$$

$$(1,1) \frac{dy}{dx} = 2$$



$$(-1,-1) \frac{dy}{dx} = -2$$

$$(2,2) \frac{dy}{dx} = 4$$

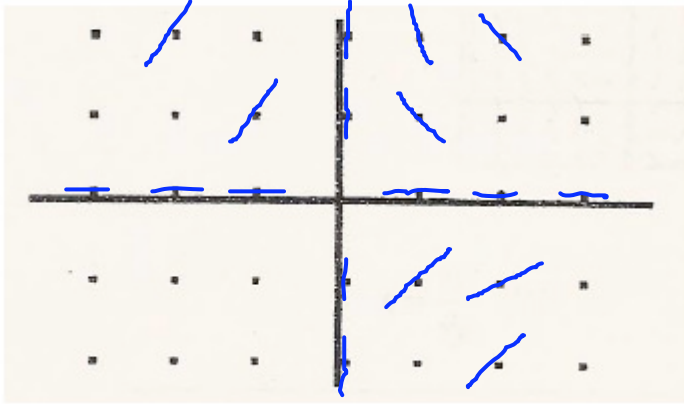
Will it be easier to draw a column at a time or a row at a time?

Now let's take a look at some "human slope fields"!

http://www.kodakgallery.com/gallery/creativeapps/slideShow/Main.jsp?token=889450867211%3A1016305379&cm_mc=site_email_-new_site_share_-core_-View_photos_link

Now let's do some more!

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



$(0,0)$ ACK!

$(0,1)$ $\frac{dy}{dx} = \text{UNDEFINED}$

$(1,1)$ $\frac{dy}{dx} = -1$

$(1,0)$ $\frac{dy}{dx} = 0$

$(1,-1)$ $\frac{dy}{dx} = 1$

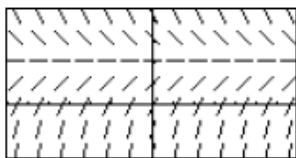
$(1,2)$ $\frac{dy}{dx} = -2$

$(2,-1)$ $\frac{dy}{dx} = \frac{1}{2}$

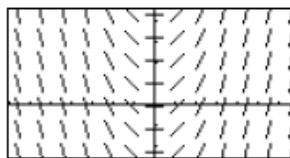
Let's try the matching in the handout:

Match the slope fields with their differential equations.

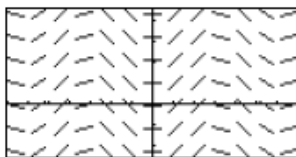
(A)



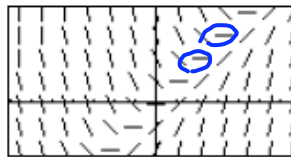
(B)



(C)



(D)



PERIODIC

7. $\frac{dy}{dx} = \sin x$

(C)

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

(D)

ROWS SAME

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

(A)

COLUMNS SAME

10. $\frac{dy}{dx} = x$

(B)

For homework do the rest of the slope fields AND the next matching on the handout [from the first page] We will do the rest of the handout as we progress through the chapter. Handout can also be found at:

http://apcentral.collegeboard.com/apc/public/repository/ap08_calculus_slopefields_worksheet.pdf