Maple file name: Last name_ Last name _Slopefields.mw

DE = Differential Equation	**Slope Field (common) = Direction Field (text)**

Open and save a new Maple document
Enter the header student package and the new DEtools package.

with(student):
with(DEtools):

Maple Commands (reference only, the lab starts on the next page)

Plotting a specific slope field ($\frac{dy}{dx} = x - y$):

$$dfieldplot([diff(x(t),t) = 1,\ diff(y(t),t) = x(t) - y(t)],[x(t), y(t)],$$
$$t = -2..2, x = -2..2,\ y = -2..2)$$

[Note, if $\frac{dx}{dt} = 1$, then $x = t$, $diff(x(t),t) = 1$, $diff(y(t),t) = x(t) - y(t)$ parameterizes $\frac{dy}{dx} = x - y$]

Plotting a specific slope field ($\frac{dy}{dx} = x - y$) and one solution curve [through (-1, 0)]

$$DEplot([diff(x(t),t) = 1,\ diff(y(t),t) = x(t) - y(t)],[x(t), y(t)],$$
$$t = -2..2, x = -2..2,\ y = -2..2,\ [[x(-1) = -1,\ y(-1) = 0]])$$

Plotting a specific slope field ($\frac{dy}{dx} = x - y$) and two solution curves [through (-1, 0) and (0, 2)]

$$DEplot([diff(x(t),t) = 1,\ diff(y(t),t) = x(t) - y(t)],[x(t), y(t)],$$
$$t = -2..2, x = -2..2,\ y = -2..2,\ [[x(-1) = -1,\ y(-1) = 0],[x(0) = 0,\ y(0) = 2]])$$

Plotting slope fields for general first order DEs

(1) Write your DE in the form $\frac{dy}{dx} = F(x, y)$

(2) In the command code:
   a. Replace $x(t) - y(t)$ with the formula for $F(x, y)$
   b. Type $x(t)$ for every instance of x in $F(x, y)$
   c. Type $y(t)$ for every instance of y in $F(x, y)$

(3) Set the desired viewing window by changing $t = -2..2, x = -2..2,\ y = -2..2$.
The t and x values must always match.

Plotting solution curves through (a, b)

$$[x(a) = a,\ y(a) = b]$$

Maple Slope Fields Lab Activities

By hand

1. Use the provided grid (label the axes) and draw the slope field for the DE $\frac{dy}{dx} = x - y$. Plot the slopes for all points $-2 \le x \le 2,\ -2 \le y \le 2$ at intervals of 0.5 in both directions. Use a ruler and be sure to plot the slopes with reasonable accuracy.

2. Carefully draw the solutions curves to the DE $\frac{dy}{dx} = x - y$ which pass through the following points (there will be 4 different solution curves).

   (i) (-1, 0) (ii) (0, 1) (iii) (1, 0) (iv) (0, -2)

In Maple

3. $\frac{dy}{dx} = x - y$
   a. Sketch the slope field.
   b. Draw the solution curves passing through (-1, 0). (0, 1), (1, 0) and (0, -2). Right click on each solution curve and change it to a different color; provide a key.

4. $y' = x^2 \sin y$
   a. Sketch the slope field.
   b. Sketch the solution curve passing through (0, 1) and three more points of your choosing . Color the curves and provide a key.

5. $y' = x(y^2 - 4)$
   a. Sketch the slope field.
   b. Sketch the solution curve passing through (0, 1) and three more points of your choosing . Color the curves and provide a key.

6. Make up your own DE of the form $\frac{dy}{dx} = F(x, y)$
   a. Sketch the slope field.
   b. Sketch the solution curve passing through four points of your choosing.
   Color the curves and provide a key.

One copy/partner pair: Email your correctly named Maple worksheet to fleschb@wou.edu
Email subject line: Maple Slope

Name: _____ **Math 252: Slope Field Lab**

Hand sketch: Slope field for $\frac{dy}{dx} = x - y$