

Creating Direction Fields with DERIVE 5

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This tutorial describes how to use DERIVE 5 to generate a direction field for the first order differential equation:

$$\frac{dy}{dx} = r(x,y)$$

Direction fields can be created using the function `DIRECTION_FIELD`. The `DIRECTION_FIELD` function has the following syntax:

```
DIRECTION_FIELD(r,x,x0,xm,m,y,y0,yn,n)
r = right hand side function r(x,y)
x = name of the independent variable
y = name of the dependent variable
x0 = lower bound on the x values to be plotted.
xm = upper bound on the x values to be plotted.
m = number of steps in the x direction
y0 = lower bound on the y values
yn = upper bound on the y values
n = number of steps in the y direction
```

The following is an example of how you can use this function to generate a direction field for the ODE

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

Hint: use `x`, not `t`.

1. Define the function by typing the following in the **Input window** and hit Enter:

```
r(x,y) := y-x
```

(Note: The colon before the '=' sign is essential!)

2. Execute the `DIRECTION_FIELD` function by typing the following in the **Input window** and then hit Enter again:

```
DIRECTION_FIELD(r(x,y),x,-3,3,24,y,-2,2,8)
```

3. Open a 2D-plot window by clicking on **New 2D-plot Window** under the **Window** pull-down menu.

4. On the **Options** pull-down menu, select **Display**.

Click on the "Points" tab.

Select Connect = "Yes" and Size = "Small".

Click on "OK".

Go back to the "Options" pull-down menu.

Deselect "Change Plot Colors" <default>.

This will automatically exit you from the menu.

Go back to the "Options" pull-down menu again.

Select "Approximate Before Plotting".

NOW, you're ready to plot.

5. To generate the plot use the Insert > Plot command while in the 2D-plot window.

6. If you did everything right, you should get a picture that looks like the following:

