

Direction Fields ¹

1. `dfield6` is a MATLAB program for MATLAB Version 6 that may be retrieved from the website at <http://math.rice.edu/~dfield/> and other versions are also available at this site. If you don't have it, copy it into `C:\Matlab\Work` (or `C:\MatlabR12\Work`).
2. In MATLAB, enter the command: `dfield6`
3. A `DFIELD` Setup window appears.
4. The differential equation $x' = x^2 - t$ appears in the boxes for
The differential equation.
5. Using MATLAB notation, change these entries to enter the differential equation $y' = \sin y$.
6. The independent variable by default is `t` so leave that entry unchanged.
7. For The `display` window settings,
 - (a) enter `-5` for the minimum value of `t`
 - (b) enter `5` for the maximum value of `t`
 - (c) enter `-2*pi` for the minimum value of `y`
 - (d) enter `2*pi` for the maximum value of `y`.
8. Click on the `Proceed` button. The direction field for your differential equation will appear in another window.
9. At the top of this window, you can click on `Options` and pull down to `Window settings`. Here you can select `Arrows` instead of `Lines` for your direction field plot.
10. If you click at any point in the direction field plot, a solution curve through that point is plotted. Several solution curves can be plotted by clicking on more than one point.

Following the methodology above, do the following.

- (a) Print out or carefully sketch by hand the direction field of the differential equation

$$y' = \frac{2y}{t} \quad (\text{Choose } -5 \leq t \leq 5, \text{ and } -10 \leq y \leq 10.)$$

- (b) Superimpose some solutions (say, two above the `t`-axis and two below the `t`-axis) on the direction field in part (a).
- (c) Use the information in parts (a) and (b) to guess a one-parameter family of solutions of the differential equation.

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