Systems Graphs

Consider the differential equation.

$x'' + 4\,x' + 20\,x = 0$

To view the graph for the Second Order equation, a system must be built as following.

$$\begin{aligned} \frac{dx}{dt} &= y \\ \frac{dy}{dt} &= -20\,x - 4\,y \end{aligned}$$

Next, to see the direction field click on **Window → 2-dim** followed by **Equa → Differential → dx/dt...**

Find the direction fields of the following systems.

$$\begin{aligned} \tfrac{dx}{dt} &= 0.8\,x - 0.7\,x\,y \\ \tfrac{dy}{dt} &= -0.9\,y + 0.6\,x\,y \end{aligned}$$

$$\begin{aligned} \tfrac{dx}{dt} &= y \\ \tfrac{dy}{dt} &= -9\,x \end{aligned}$$

$$\begin{aligned} \tfrac{dx}{dt} &= (1 - x/5)\,x - 0.8\,x\,y \\ \tfrac{dy}{dt} &= -2\,y + 1.5\,x\,y \end{aligned}$$

To see the solution curve through an initial point click on

One → Initial-value problems → 2. dx/dt trajectory...

Next, enter the initial point coordinates and pick the settings.

For the Second Order differential equations graph the direction field and view the solution through the initial conditions.

$x'' + 8\,x' + 25\,x = 0$ initial conditions $x_0 = 1$, $x_0' = 3$

$x'' + 6\,x' + 8\,x = 0$ initial conditions $x_0 = 1$, $x_0' = 0$

$2\,x'' + 3\,x = 0$ initial conditions $x_0 = 2$, $x_0' = -3$