Graphing Slopefields with Maple

▼ Setup

The DEtools package has DEplot to graph slopefields (and differential equations in general) .
with (*DEtools, DEplot*);

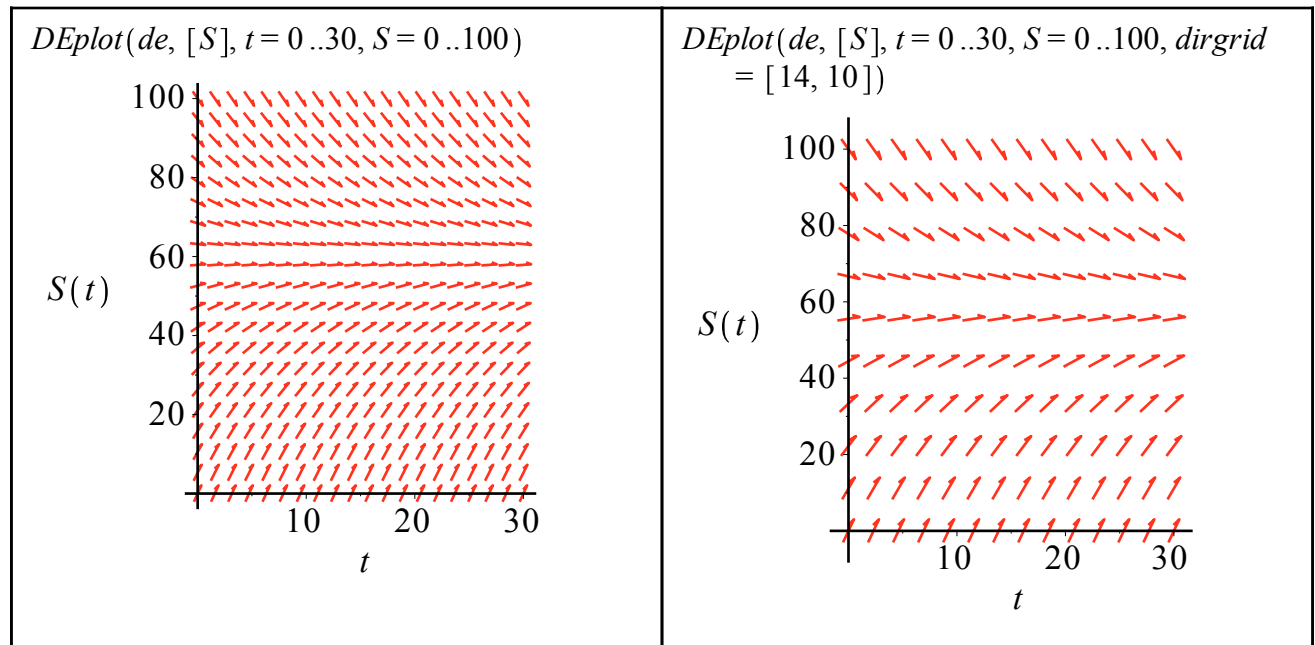$$[DEplot]$$ **(1.1)**

? DEplot

▼ Simple Slope Field Example

Define a simple differential equation. Then use DEplot to graph the slopefield.

$de := S'(t) = 6 - \dfrac{S(t)}{10}$

$$de := \mathrm{D}(S)(t) = 6 - \frac{S(t)}{10}$$ **(2.1)**

$DEplot(de, [S], t = 0..30, S = 0..100)$

$DEplot(de, [S], t = 0..30, S = 0..100, dirgrid = [14, 10])$

▼ Adding Solution Curves
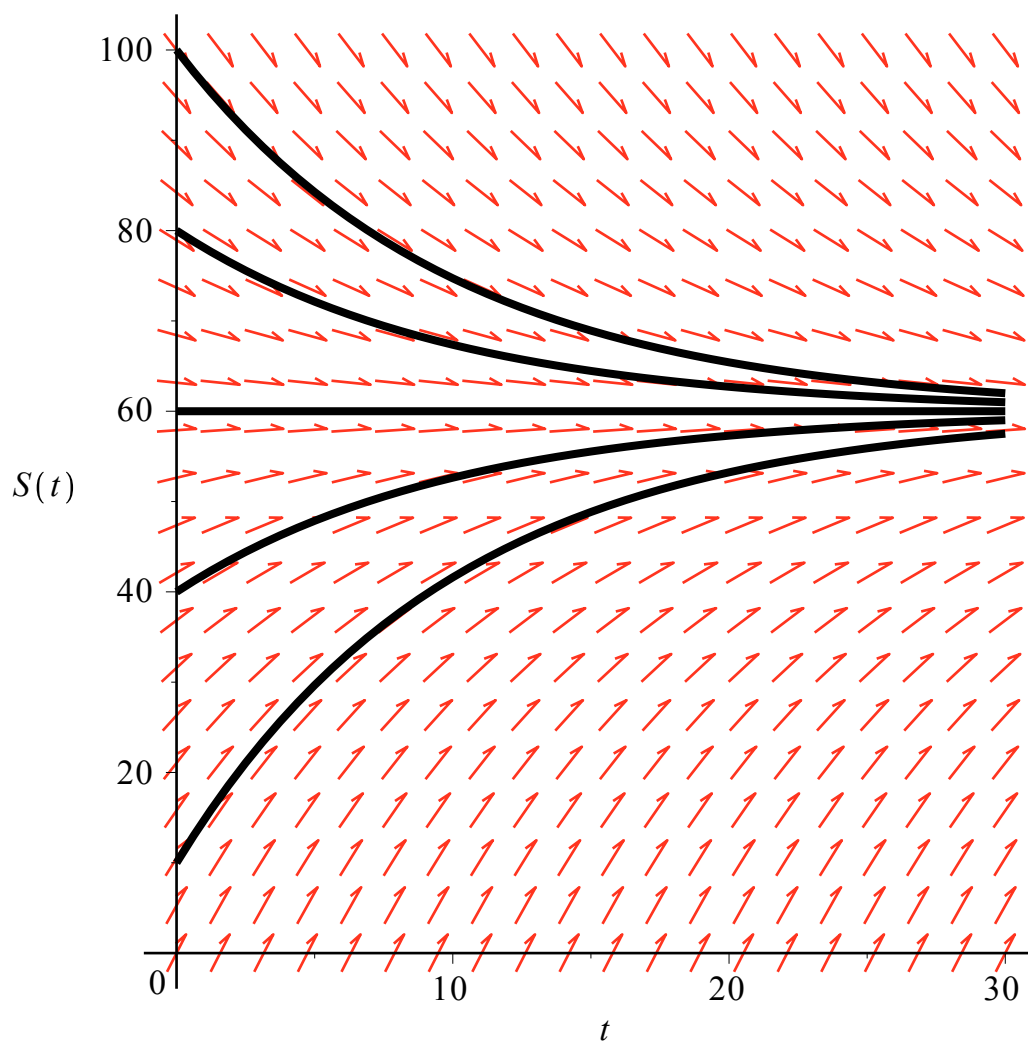
We can add solution curves to theplot by specifying initial conditions in a list.
$InitCond := [[S(0) = 10], [S(0) = 40], [S(0) = 60], [S(0) = 80], [S(0) = 100]]$

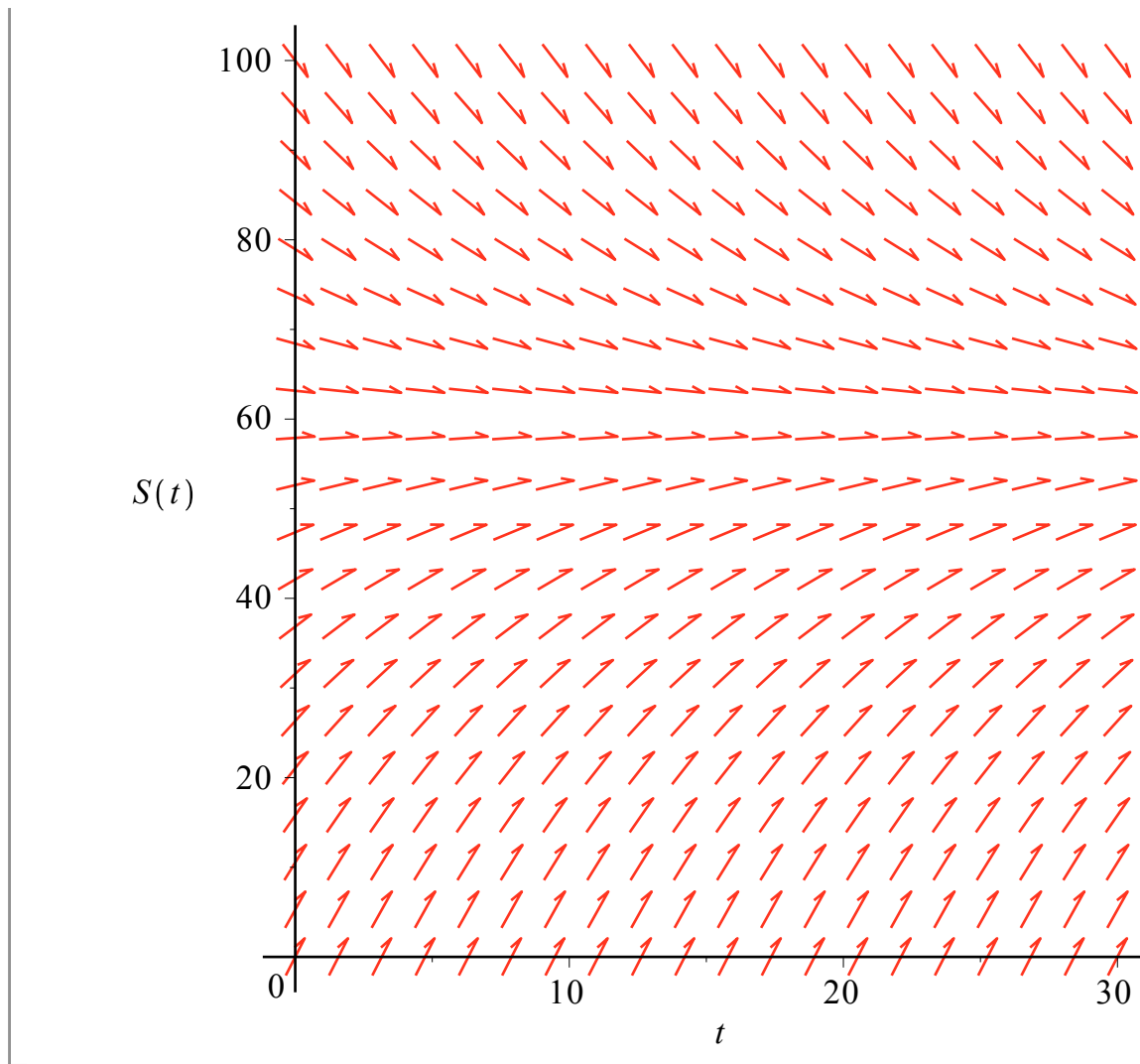$$InitCond := [[S(0) = 10], [S(0) = 40], [S(0) = 60], [S(0) = 80], [S(0) = 100]]$$ **(3.1)**

$DEplot(de, [S], t = 0..30, S = 0..100, InitCond, linecolor = black)$

▼ Follow the Curves

Watch the plot develop...

DEplot(*de*, [*S*], *t* = 0 ..30, *S* = 0 ..100, [[*S*(0) = 10], [*S*(0) = 80]], *animatecurves* = *true*, *linecolor* = *black*)

Analytic Solution to an IVP

The function <u>dsolve</u> is a variant of solve that finds solutions *when possible*.
$dsolve(\{de, S(0) = 10\}, S(t))$

$$S(t) = 60 - 50\, e^{-\frac{t}{10}}$$ **(5.1)**

$dsolve[interactive](de)$