Nonlinear Equations

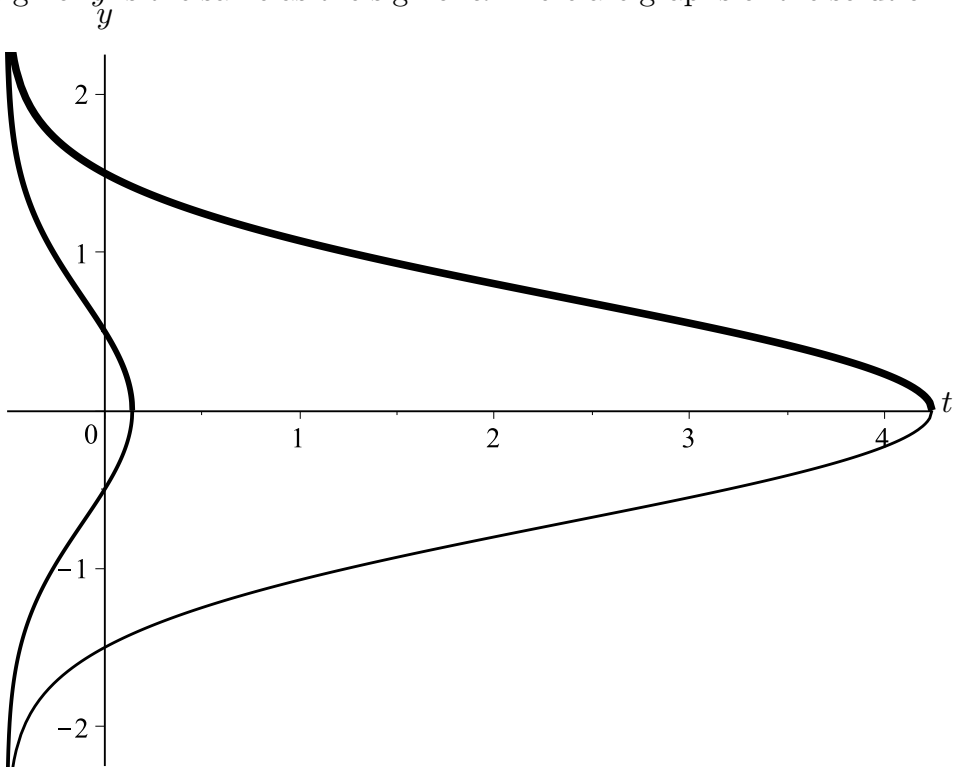
In class we found that the solution to the equation

$$y\dot{y}(1+2t) = -1, \quad y(0) = \alpha$$

is given by

$$y(t) = \pm\sqrt{\alpha^2 - \log(1+2t)}, \tag{1}$$

where the sign of y is the same as the sign of α. Here are graphs of the solution for various α.



Graphs of (1) for $\alpha = \pm 1/2, \pm 3/2$.

Note that the interval of existence of the solution depends on what the initial condition is.