

Sec 2.4 Analytic Methods for Special Systems

checking solutions

$$\frac{dx}{dt} = -x + y$$

$$\frac{dy}{dt} = -3x - 5y$$

The system can be rewritten in vector form

$$\frac{d\bar{y}}{dt} = \bar{F}(\bar{y})$$

where $\bar{y}(t) = (x(t), y(t))$ and

$$\bar{F}(x, y) = (-x + y, -3x - 5y)$$

Suppose we are told that

$$\bar{y}(t) = (x(t), y(t)) = (e^{-4t} - 3e^{-2t}, -3e^{-4t} + 3e^{-2t})$$

is a solution. How do we check?

Decoupled Systems

Example 1: Completely decoupled

$$\frac{dx}{dt} = -2x$$

$$\frac{dy}{dt} = -y$$

Example 2 - Partially decoupled systems

$$\frac{dx}{dt} = 2x + 3y$$

$$\frac{dy}{dt} = -4y$$

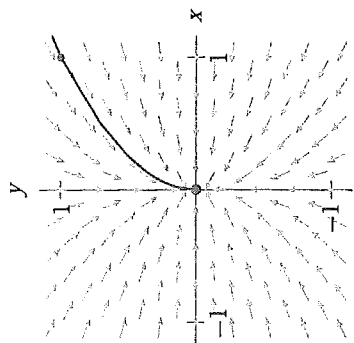


Figure 2.40
The solution curve
 $Y(t) = (e^{-2t}, e^{-t})$.

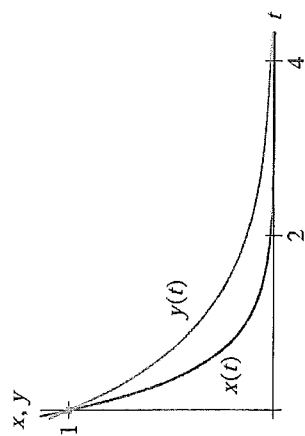


Figure 2.41
The $x(t)$ - and $y(t)$ -graphs for the solution
 $(x(t), y(t)) = (e^{-2t}, e^{-t})$.

