$$y_5^c = y_3 + \frac{h}{3}(f_3 + 4f_4 + f_5)$$

$$= 0.4999585$$

Modifier $E_{tc} = 0.0000303$

Modified $y_5^c = 0.4999888$

Exact answer = 0.5

Error = 0.0000112

13.10 SYSTEMS OF DIFFERENTIAL EQUATIONS

Mathematical models of many applications involve a system of several first-order differential equations. They may be represented as follows:

$$\frac{dy_1}{dx} = f_1(x, y_1, y_2, \ldots, y_m), \qquad y_1(x_0) = y_{10}$$

$$\frac{dy_2}{dx} = f_2(x, y_1, y_2, \ldots, y_m), \qquad y_2(x_0) = y_{20}$$

$$\vdots \qquad (13.50)$$

$$\frac{dy_m}{dx} = f_m(x, y_1, y_2, \ldots, y_m), \qquad y_m(x_0) = y_{m0}$$

These equations should be solved for $y_1(x), y_2(x), \ldots, y_m(x)$ over interval (a, b).

These equations can be solved by any of the methods discussed in this chapter. At each stage, all the equations are solved before proceeding to the next stage. For example, if $h = 0.5$ and $a = x_0 = 0$, then we must evaluate $y_1(0.5), y_2(0.5), \ldots, y_m(0.5)$ before preceding to the stage $h = 1.0$. Let us consider a system of two equations for the purpose of illustration.