

Exercises for applications of matrix diagonalization

1. Use matrix diagonalization to solve the recursion

$$y_{n+1} = 5y_n - 6y_{n-1}, \quad y_0 = 2, y_1 = 5$$

2. Use matrix diagonalization to solve the differential equation

$$y'' = 5y' - 6y, \quad y(0) = 2, y'(0) = 5$$

3. Use matrix diagonalization to solve the vector recursion

$$x_{n+1} = -x_n + y_n$$

$$y_{n+1} = x_n - y_n$$

$$x_0 = 0$$

$$y_0 = 2$$

4. Use matrix diagonalization to solve the system of differential equations

$$u' = -u + v$$

$$v' = u - v$$

$$u(0) = 0$$

$$v(0) = 2$$