

**Några svar till svarslösa uppgifter i läroboken.**

**7.1**

- 2a)  $\lambda = 3, \lambda = -1,$   
b)  $\lambda = 4$   
c)  $\lambda = \sqrt{12}, \lambda = -\sqrt{12}$   
d) Inga reella egenvärden.
- 3a)  $\lambda = 3$  ger egenvektorn  $(1/2, 1)$ ,  $\lambda = -1$  ger egenvektorn  $(0, 1)$ .  
b)  $\lambda = 4$  ger egenvektorn  $(3/2, 1)$ .  
c)  $\lambda = \sqrt{12}$  ger egenvektorn  $(3/\sqrt{12}, 1)$ ,  $\lambda = -\sqrt{12}$  ger egenvektorn  $(-3/\sqrt{12}, 1)$ .  
d) Inget.
- 5a)  $\lambda = 1, \lambda = 2, \lambda = 3.$   
c)  $\lambda = -8.$   
f)  $\lambda = -4, \lambda = 3.$
- 6a)  $\lambda = 1$  ger egenvektorn  $(0, 1, 0)$   $(-1/2, 1, 1)$ ,  $\lambda = 2$  ger egenvektorn  $(-1/2, 1, 1)$ ,  $\lambda = 3$  ger egenvektorn  $(-1, 1, 1)$ .  
c)  $\lambda = -8$  ger egenvektorn  $(-1 - 1, 6)$ .  
f)  $\lambda = -4$  ger egenvektorn  $(-6, 8, 3)$ , ger egenvektorn  $\lambda = 3$  ger egenvektorn  $(5, -2, 1)$ .
- 8a)  $\lambda = 1, \lambda = -2, \lambda = -1.$
- 9a)  $\lambda = 1$  ger egenvektorn  $(0, 0, 0, 1)$  och  $(2, 3, 1, 0)$ ,  $\lambda = -2$  ger egenvektorn  $(-1, 0, 1, 0)$ ,  $\lambda = -1$  ger egenvektorn  $(-2, 1, 1, 0)$ .
- 10a)  $\lambda = -1, \lambda = 5.$   
b)  $\lambda = 1, \lambda = 7, \lambda = 3.$   
c)  $\lambda = -1/3, \lambda = 1, \lambda = 1/2.$
- 11)  $\lambda = 1, \lambda = 1/512, \lambda = 512.$

**7.2**

8)

$$P = \begin{pmatrix} 4/5 & 3/4 \\ 1 & 1 \end{pmatrix}.$$

10)

$$P = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 1 \\ -1 & 0 & 1 \end{pmatrix}.$$

12) Ej diagonaliserbar.

13)

$$P = \begin{pmatrix} 1 & 2 & 1 \\ 1 & 3 & 3 \\ 1 & 3 & 4 \end{pmatrix}.$$

14) Ej diagonaliserbar.

15)

$$P = \begin{pmatrix} -1/3 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}.$$

19)

$$P = \begin{pmatrix} -1 & 10237 & -2047 \\ 0 & 1 & 0 \\ 0 & 10245 & -2048 \end{pmatrix}.$$

### 7.3

2)

$$P = \begin{pmatrix} 1/\sqrt{2} & -1/\sqrt{2} \\ 1/\sqrt{2} & 1/\sqrt{2} \end{pmatrix}.$$

3

$$P = \begin{pmatrix} -2/\sqrt{7} & \sqrt{3}/\sqrt{7} \\ \sqrt{3}/\sqrt{7} & 2/\sqrt{7} \end{pmatrix}.$$

4)

$$P = \begin{pmatrix} -2/\sqrt{5} & 1/\sqrt{5} \\ 1/\sqrt{5} & 2/\sqrt{5} \end{pmatrix}.$$

5)

$$P = \begin{pmatrix} -4/5 & 0 & 3/5 \\ 0 & 1 & 0 \\ 3/5 & 0 & 4/5 \end{pmatrix}.$$

6)

$$P = \begin{pmatrix} 1/\sqrt{2} & 1/\sqrt{2} & 0 \\ 1/\sqrt{2} & -1/\sqrt{2} & 0 \\ 0 & 0 & 1 \end{pmatrix}.$$

7)

$$P = \begin{pmatrix} 1/\sqrt{3} & 1/\sqrt{6} & 1/\sqrt{2} \\ 1/\sqrt{3} & -2/\sqrt{6} & 0 \\ 1/\sqrt{3} & 1/\sqrt{6} & -1/\sqrt{2} \end{pmatrix}.$$

**9.5**

4a)  $2x^2 + 5y^2 - 6xy$ .

c)  $x^2 - 3y^2 + 5z^2$ .

d)  $-2x_1^2 + 3x_3^2 + 7x_1x_2 + x_1x_3 + 12x_2x_3$ .

6a) max 4, min -2 i  $\pm(1/\sqrt{6}, 1/\sqrt{6}, 2/\sqrt{6})$  resp  $\pm(-1/\sqrt{3}, -1/\sqrt{3}, 1/\sqrt{3})$

b) max 3, min 0 i  $\pm(2/\sqrt{6}, 1/\sqrt{6}, 1/\sqrt{6})$  resp  $\pm(1/\sqrt{3}, -1/\sqrt{3}, -1/\sqrt{3})$

c) max 4, min 2 i  $\pm(1/\sqrt{2}, 0, 1/\sqrt{2})$  resp  $\pm(-1/\sqrt{2}, 0, 1/\sqrt{2})$  och  $\pm(0, 1, 0)$ .

**9.6**

2a)

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \frac{1}{3} \begin{pmatrix} 2 & 1 & 2 \\ -2 & 2 & 1 \\ -1 & -2 & 2 \end{pmatrix} \begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix}$$

$y_1^2 + 7y_2^2 + 4y_3^2$ .

10)  $13y''^2 - 4x''^2 = 8$ , hyperbel.

**9.7**

7a)  $9x'^2 + 36y'^2 + 4z'^2 = 36$ , ellipsoid.

b)  $6x'^2 + 3y'^2 - 2z'^2 = 18$ , enmantlad hyperboloid.

c)  $3x'^2 - 3y'^2 - z'^2 = 3$ , tvåmantlad hyperboloid.

f)  $7x'^2 - 3y'^2 + z' = 0$ , hyperbolisk paraboloid.

8) a)  $25x'^2 - 3y'^2 - 50z'^2 = 150$  tvåmantlad hyperboloid.

b)  $2x'^2 + 2y'^2 + 8z'^2 = 5$ , ellipsoid.

c)  $9x'^2 + 4y'^2 - 36z' = 0$ , elliptisk paraboloid.

d)  $x'^2 - y'^2 + z' = 0$ , hyperbolisk paraboloid.