

2a

$$A = \begin{bmatrix} 4 & -2 \\ 1 & 1 \end{bmatrix} \quad x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

$$Ax = \lambda x$$

$$A \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \lambda \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

$$\textcircled{1} \quad 4x_1 - 2x_2 = \lambda x_1$$

$$\textcircled{2} \quad x_1 + x_2 = \lambda x_2$$

$$r = \frac{x_2}{x_1}$$

$$\left. \begin{array}{l} 4r - 2 = \lambda \\ r + 1 = \lambda \end{array} \right\} \text{ where } r = \frac{x_2}{x_1}$$

$$\frac{4r-2}{r} = r+1$$

$$8 - 2 = 2 \times 2$$

$$8 - 2 = \lambda 2$$

$\lambda = 3$ eigenvalue

$$4r - 2 = r^2 + r$$

$$0 = r^2 - 3r + 2$$

$$0 = (r-1)(r-2)$$

$$r = 1 \text{ or } r = 2$$

$$1 + 1 = \lambda \quad 2 + 1 = \lambda$$

eigen
value

$$\lambda = 2 \text{ or } \lambda = 3$$

$$\lambda \begin{bmatrix} e_1 \\ e_2 \end{bmatrix}$$

$$\begin{bmatrix} 4 & -2 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} e_1 \\ e_2 \end{bmatrix} = \begin{bmatrix} 2e_1 \\ 2e_2 \end{bmatrix}$$

$$4e_1 - 2e_2 = 2e_1$$

$$e_1 + e_2 = 2e_2$$

$$e_1 = e_2$$

$$\begin{bmatrix} 1/\sqrt{2} \\ 1/\sqrt{2} \end{bmatrix} \text{ eigenvector for } \lambda = 2$$

↳ yeah this is not great