

Exploring Matrices Exercises Answers

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Multiply

1.

$$\begin{pmatrix} 8 + 1 + 6 \\ 3 + 5 + 7 \\ 4 + 9 + 2 \end{pmatrix} = \begin{pmatrix} 15 \\ 15 \\ 15 \end{pmatrix}$$

$$\begin{pmatrix} 8 \\ 3 \\ 4 \end{pmatrix} + \begin{pmatrix} 1 \\ 5 \\ 9 \end{pmatrix} + \begin{pmatrix} 6 \\ 7 \\ 2 \end{pmatrix} = \begin{pmatrix} 15 \\ 15 \\ 15 \end{pmatrix}$$

2.

$$\begin{pmatrix} 1 + 2z + 3 \\ 4 + 5z + 6 \\ 7 + 8z + 9 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} 1 \\ 4 \\ 7 \end{pmatrix} + z \begin{pmatrix} 2 \\ 5 \\ 8 \end{pmatrix} + \begin{pmatrix} 3 \\ 6 \\ 9 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$

$$z = -2$$

3.

m- m+: row dimension.
 n- n+: inner dimension.
 p- p+: column dimension.
 _ |: rows or columns.

\ /: speed.
 S M: subscript matrix or magic square.
 #: repeat.

4.

n^2

5.

mnp

Rotations and Scaling

1.

$$\begin{pmatrix} 0.866 & 0.500 \\ -0.500 & 0.866 \end{pmatrix}$$

2. xkcd rotates the *image* of a vector.3. $\text{acosd}(0.8) = 36.87^\circ$ 4. $\text{acosd}(0.5) = 60^\circ$ 5. https://blogs.mathworks.com/cleve/files/Rotate_hand.m .

Computer Graphics

1.

$$\begin{pmatrix} 1 & 0 & 0 & d \\ 0 & 1 & 0 & e \\ 0 & 0 & 1 & f \\ 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \\ 1 \end{pmatrix} = \begin{pmatrix} x + d \\ y + e \\ z + f \\ 1 \end{pmatrix}$$

2. $-90^\circ:90^\circ$

3. red. Edit pplane.m. Line 4619: cdata = [0.6860 0.1330 0.0000].

4. Resolution grid size. Raise and lower lid.

5. 15.

Matrices and Cubes

1. Gray.

2. See lines 3:6 of `tooltips.m`.

3. 20 for half-turn metric, 26 for quarter-turn metric. Maximally scrambled cubes, superflip and superflip plus fourscore.

4.

- LRUDFB. Cannot beat \leq , 6 moves.
- LRL ' R ' . Cannot beat \leq , 4 moves.
- FLLLRB. 4 moves, B ' R ' LF ' .
- Q26. Cannot beat \leq , 26 moves.
- `rng(2)`, \Rightarrow is UDUR ' RD ' . 4 moves, DU ' D ' U ' . Or, just 2 moves, UU.

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