

Exercises#3

KINEMATICS AND DYNAMICS Course ID: 01416308

65011428@kmitl.ac.th [Switch account](#)

Not shared

* Indicates required question

Sec No.? *

Your answer

Student ID (Member No.1) *

Your answer

Fullname (Member No.1) *

Your answer

1. Pls select the correct answer. * 1 point

1. Which of these matrices represents a rotation of theta around the Z axis?

- A. $\begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ B. $\begin{bmatrix} \cos\theta & 0 & \sin\theta \\ 0 & 1 & 0 \\ -\sin\theta & 0 & \cos\theta \end{bmatrix}$ C. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\theta & -\sin\theta \\ 0 & \sin\theta & \cos\theta \end{bmatrix}$

- ☒ a)
☐ b)
☐ c)
☐ d)

2. Pls select the correct answer. * 1 point

2. Which of these matrices represents a rotation of theta around the X axis?

- A. $\begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ B. $\begin{bmatrix} \cos\theta & 0 & \sin\theta \\ 0 & 1 & 0 \\ -\sin\theta & 0 & \cos\theta \end{bmatrix}$ C. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\theta & -\sin\theta \\ 0 & \sin\theta & \cos\theta \end{bmatrix}$

- ☐ a)
☐ b)
☒ c)
☐ d)

3. Pls select the correct answer. * 1 point

3. Which of these rotation matrices means 'no rotation'?

- A. $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ B. $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ C. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ D. $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

- ☐ a)
☐ b)
☒ c)
☐ d)

4. Pls select the correct answer. * 1 point

4. If Vector p(4, 6, -8) is rotated in counter-clockwise direction by 90 deg about x-axis. Find the rotation matrix and the coordinate value p0(?, ?, ?).

a) $\begin{bmatrix} 4 \\ 6 \\ -8 \end{bmatrix}$
b) $\begin{bmatrix} 4 \\ -6 \\ -8 \end{bmatrix}$
c) $\begin{bmatrix} 4 \\ 6 \\ 8 \end{bmatrix}$
d) $\begin{bmatrix} 4 \\ 8 \\ 10 \end{bmatrix}$

${}^0R_1 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(\theta) & -\sin(\theta) \\ 0 & \sin(\theta) & \cos(\theta) \end{bmatrix}$

- ☒ a)
☐ b)
☐ c)
☐ d)

5. Pls select the correct answer. * 1 point

5. If Vector p(10, 8, 5) is rotated in counter-clockwise direction by pi/3 rad. About z-axis, Find the rotation matrix and the coordinate value p0(?, ?, ?).

a) $\begin{bmatrix} 1.928 \\ 12.660 \\ 5 \end{bmatrix}$
b) $\begin{bmatrix} 1.928 \\ 12.660 \\ -5 \end{bmatrix}$
c) $\begin{bmatrix} 5.928 \\ -12.660 \\ -5 \end{bmatrix}$
d) $\begin{bmatrix} -1.928 \\ 12.660 \\ -5 \end{bmatrix}$

${}^0R_z = \begin{bmatrix} \cos(\theta) & -\sin(\theta) & 0 \\ \sin(\theta) & \cos(\theta) & 0 \\ 0 & 0 & 1 \end{bmatrix}$

- ☐ a)
☒ b)
☐ c)
☐ d)

6. Pls select the correct answer. * 1 point

6. If Vector p(10, 8, 5) is rotated in clockwise direction by pi/8 rad. About z-axis, Find the rotation matrix and the coordinate value p0(?, ?, ?).

a) $\begin{bmatrix} 12.3 \\ -2.564 \\ 5.0 \end{bmatrix}$
b) $\begin{bmatrix} 12.3 \\ -2.564 \\ 5.0 \end{bmatrix}$
c) $\begin{bmatrix} 12.3 \\ -3.564 \\ 5.0 \end{bmatrix}$
d) $\begin{bmatrix} 12.3 \\ 3.564 \\ 5.0 \end{bmatrix}$

${}^0R_z = \begin{bmatrix} \cos(\theta) & -\sin(\theta) & 0 \\ \sin(\theta) & \cos(\theta) & 0 \\ 0 & 0 & 1 \end{bmatrix}$

- ☐ a)
☐ b)
☐ c)
☒ d)

7. Pls select the correct answer. * 1 point

7. If Vector p(15, 5, -2) is rotated in counter-clockwise direction by 60 degree. About Y-axis, Find the rotation matrix and the coordinate value p0(?, ?, ?).

a) $\begin{bmatrix} 5.768 \\ -5 \\ -13.99 \end{bmatrix}$
b) $\begin{bmatrix} 5.768 \\ 5 \\ -13.99 \end{bmatrix}$
c) $\begin{bmatrix} 5.768 \\ 5 \\ -13.99 \end{bmatrix}$
d) $\begin{bmatrix} 5.768 \\ 5 \\ 9.99 \end{bmatrix}$

${}^0R_y = \begin{bmatrix} \cos(\theta) & 0 & \sin(\theta) \\ 0 & 1 & 0 \\ -\sin(\theta) & 0 & \cos(\theta) \end{bmatrix}$

- ☐ a)
☐ b)
☒ c)
☐ d)

8. Pls select the correct answer. * 1 point

8. If Vector p(14, 8, -8) is rotated in clockwise direction by pi/4 rad. About Y-axis, Find the rotation matrix and the coordinate value p(?, ?, ?).

a) $\begin{bmatrix} 15.556 \\ 8 \\ 4.243 \end{bmatrix}$
b) $\begin{bmatrix} 15.556 \\ 8 \\ -4.243 \end{bmatrix}$
c) $\begin{bmatrix} 15.556 \\ -8 \\ 4.243 \end{bmatrix}$
d) $\begin{bmatrix} 15.556 \\ 8 \\ -4.243 \end{bmatrix}$

${}^0R_y = \begin{bmatrix} \cos(\theta) & 0 & \sin(\theta) \\ 0 & 1 & 0 \\ -\sin(\theta) & 0 & \cos(\theta) \end{bmatrix}$

- ☒ a)
☐ b)
☐ c)
☐ d)

9. Pls select the correct answer. * 1 point

9. If Vector p0(3, -7, -4) is the results from rotation in counter-clockwise direction by 60 deg about x-axis, Find the rotation matrix and the coordinate value p(?, ?, ?).

a) $\begin{bmatrix} 3 \\ 12.123 \\ -4 \end{bmatrix}$
b) $\begin{bmatrix} 3 \\ -7 \\ 3 \end{bmatrix}$
c) $\begin{bmatrix} 3 \\ -12.123 \\ 4 \end{bmatrix}$
d) $\begin{bmatrix} 3 \\ 7 \\ 4 \end{bmatrix}$

${}^0R_{1x} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(\theta) & -\sin(\theta) \\ 0 & \sin(\theta) & \cos(\theta) \end{bmatrix}$

${}^0P = {}^0R_{1x} {}^1P$

${}^1P = {}^0R_{1x}^{-1} {}^0P$

- ☐ a)
☐ b)
☒ c)
☐ d)

10. Pls select the correct answer. * 1 point

10. If Vector p0(1, 2, 3) is the results from rotation in clockwise direction by 45 deg about Z-axis, Find the rotation matrix and the coordinate value p(?, ?, ?).

a) $\begin{bmatrix} 0.7071 \\ 2.1213 \\ 3 \end{bmatrix}$
b) $\begin{bmatrix} -0.7071 \\ 2.1213 \\ -3 \end{bmatrix}$
c) $\begin{bmatrix} -0.7071 \\ -2.1213 \\ -3 \end{bmatrix}$
d) $\begin{bmatrix} -0.7071 \\ 2.1213 \\ 3 \end{bmatrix}$

${}^0R_{1z} = \begin{bmatrix} \cos(\theta) & -\sin(\theta) & 0 \\ \sin(\theta) & \cos(\theta) & 0 \\ 0 & 0 & 1 \end{bmatrix}$

${}^0P = {}^0R_{1z} {}^1P$

${}^1P = {}^0R_{1z}^{-1} {}^0P$

- ☐ a)
☐ b)
☐ c)
☒ d)

11. Pls select the correct answer. * 1 point

11. Suppose I know the rotation of the 1 frame relative to the 0 frame, and I know the rotation of the 2 frame relative to the 1 frame. How can I find the rotation of the 2-frame relative to the 0 frame?

- A. ${}^0R_2 = {}^1R_2 + {}^0R_1$ B. ${}^0R_2 = {}^0R_1 + {}^1R_2$ C. ${}^0R_2 = {}^1R_2 {}^0R_1$ D. ${}^0R_2 = {}^0R_1 {}^1R_2$

- ☐ a)
☐ b)
☐ c)
☒ d)

12. Pls select the correct answer. * 1 point

12. Suppose that we rotate a frame 30 degrees around X, then rotate 60 degrees around the new (rotated) Y axis. Which of these matrices is the rotation matrix for these two rotations?

- A. $\begin{bmatrix} 0.5 & 0 & 0.866 \\ 0.75 & 0.5 & -0.433 \\ -0.433 & 0.866 & 0.25 \end{bmatrix}$ B. $\begin{bmatrix} 0.5 & 0.75 & 0.433 \\ 0 & 0.5 & -0.866 \\ -0.866 & 0.433 & 0.25 \end{bmatrix}$ C. $\begin{bmatrix} 0.5 & 0 & 0.866 \\ 0.433 & 0.866 & -0.25 \\ -0.75 & 0.5 & 0.433 \end{bmatrix}$ D. $\begin{bmatrix} 0.866 & 0 & 0.5 \\ 0.25 & 0.866 & -0.433 \\ -0.433 & 0.5 & 0.75 \end{bmatrix}$

- ☐ a)
☐ b)
☒ c)
☐ d)

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1. Pls select the correct answer. *

1 point

1. Which of these matrices represents a rotation of theta around the Z axis?

A. $\begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ B. $\begin{bmatrix} \cos\theta & 0 & \sin\theta \\ 0 & 1 & 0 \\ -\sin\theta & 0 & \cos\theta \end{bmatrix}$ C. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\theta & -\sin\theta \\ 0 & \sin\theta & \cos\theta \end{bmatrix}$

- ☒ a)
- ☐ b)
- ☐ c)
- ☐ d)

2. Pls select the correct answer. *

1 point

2. Which of these matrices represents a rotation of theta around the X axis?

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- ☐ a)
- ☐ b)
- ☒ c)
- ☐ d)

3. Pls select the correct answer. *

1 point

3. Which of these rotation matrices means 'no rotation'?

A. $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ B. $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ C. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ D. $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

- ☐ a)
- ☐ b)
- ☒ c)
- ☐ d)

4. Pls select the correct answer. *

1 point

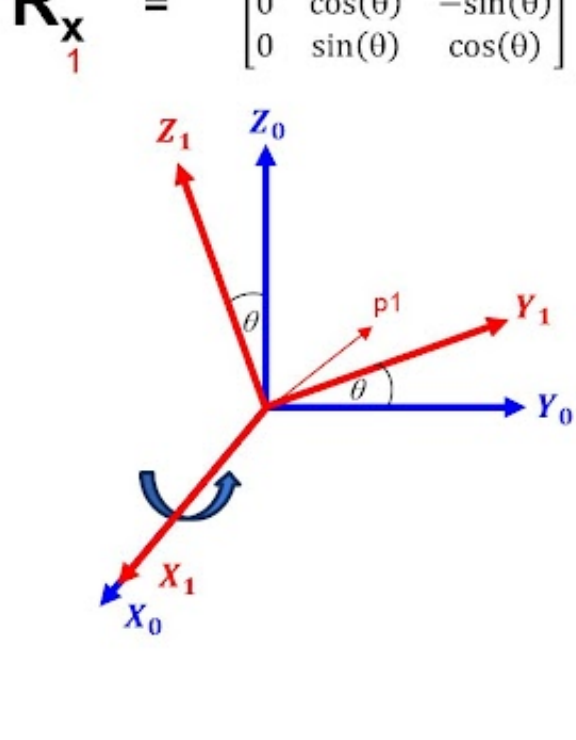
4. If Vector p(4, 6, -8) is rotated in counter-clockwise direction by 90 deg about x-axis, Find the rotation matrix and the coordinate value p0(?, ?, ?).

a) $\begin{bmatrix} 4 \\ 6 \\ -8 \end{bmatrix}$

b) $\begin{bmatrix} 4 \\ -6 \\ 8 \end{bmatrix}$

c) $\begin{bmatrix} 4 \\ 8 \\ 6 \end{bmatrix}$

d) $\begin{bmatrix} 4 \\ 8 \\ 10 \end{bmatrix}$



- ☒ a)
- ☐ b)
- ☐ c)
- ☐ d)

5. Pls select the correct answer. *

1 point

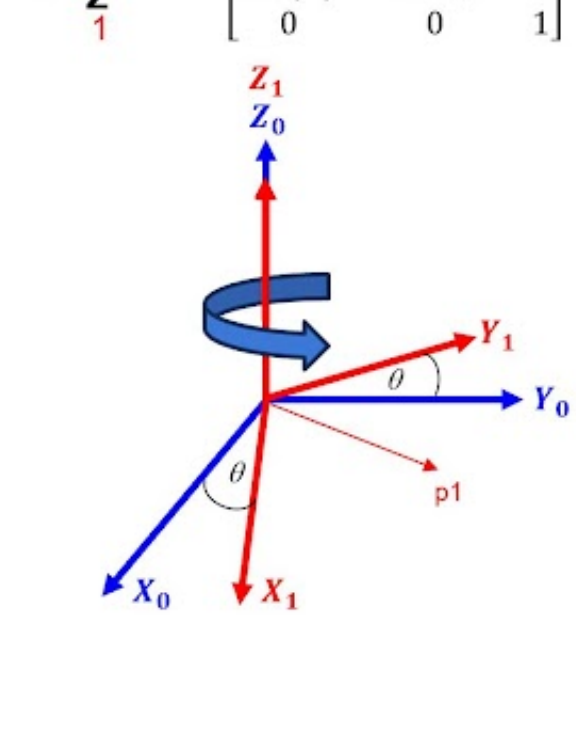
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a) $\begin{bmatrix} 1.928 \\ 12.660 \\ 5 \end{bmatrix}$

b) $\begin{bmatrix} -1.928 \\ 12.660 \\ 5 \end{bmatrix}$

c) $\begin{bmatrix} -1.928 \\ -12.660 \\ 5 \end{bmatrix}$

d) $\begin{bmatrix} -1.928 \\ 12.660 \\ -5 \end{bmatrix}$



- ☐ a)
- ☒ b)
- ☐ c)
- ☐ d)

6. Pls select the correct answer. *

1 point

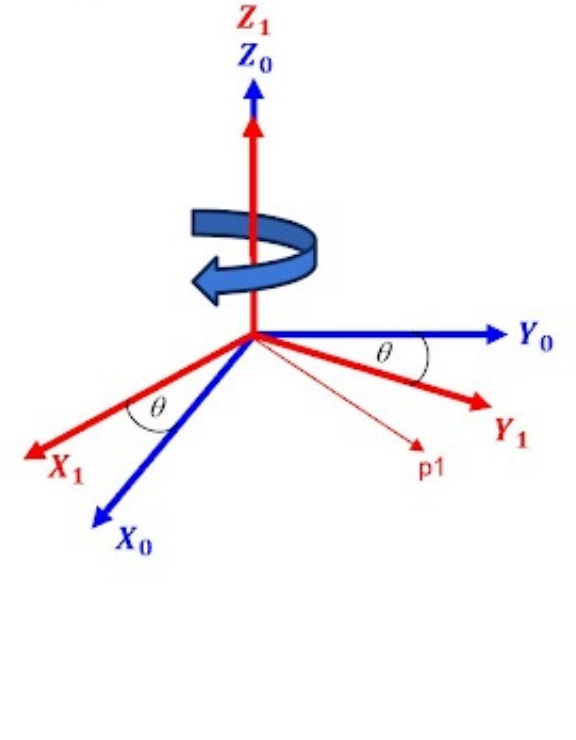
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c) $\begin{bmatrix} 12.3 \\ -3.564 \\ 5.0 \end{bmatrix}$

d) $\begin{bmatrix} 12.3 \\ -2.564 \\ 5.0 \end{bmatrix}$



- ☐ a)
- ☐ b)
- ☐ c)
- ☒ d)

7. Pls select the correct answer. *

1 point

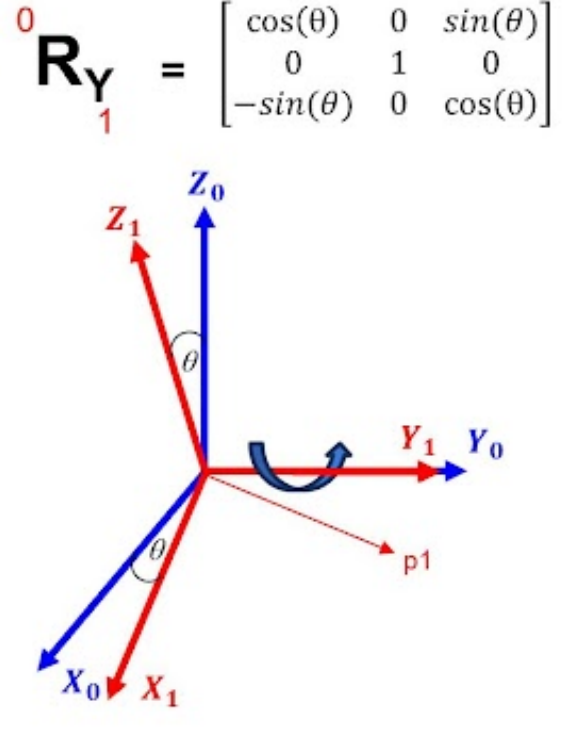
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d) $\begin{bmatrix} 5.768 \\ -5 \\ -13.99 \end{bmatrix}$



- ☐ a)
- ☐ b)
- ☒ c)
- ☐ d)

8. Pls select the correct answer. *

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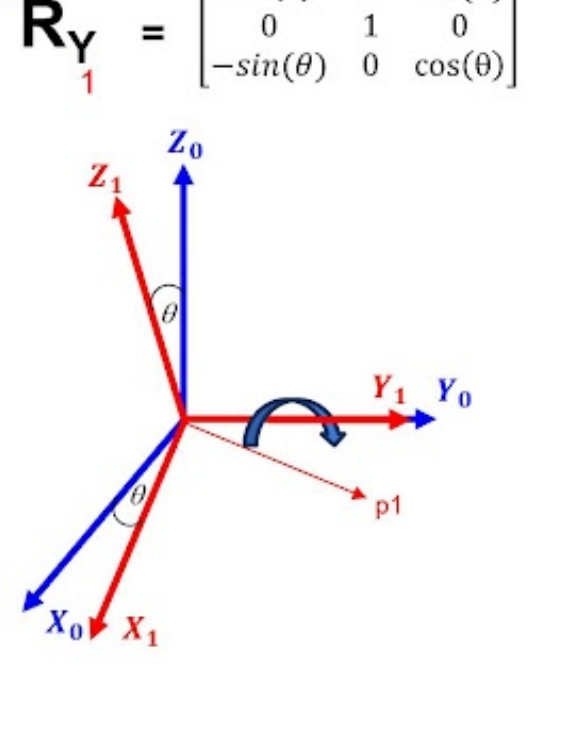
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a) $\begin{bmatrix} 3 \\ -7 \\ -4 \end{bmatrix}$

b) $\begin{bmatrix} 3 \\ -7 \\ 4 \end{bmatrix}$

c) $\begin{bmatrix} 3 \\ -7 \\ 4 \end{bmatrix}$

d) $\begin{bmatrix} 3 \\ -7 \\ 4 \end{bmatrix}$

$R_{1x} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(\theta) & -\sin(\theta) \\ 0 & \sin(\theta) & \cos(\theta) \end{bmatrix}$

$P = {}^0R_{1x} {}^1P$

${}^1P = {}^0R_{1x}^{-1} {}^0P$

- ☐ a)
- ☐ b)
- ☒ c)
- ☐ d)

10. Pls select the correct answer. *

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$P = {}^0R_{1z} {}^1P$

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- ☐ a)
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- ☐ a)
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- ☐ a)
- ☐ b)
- ☒ c)
- ☐ d)

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