Congratulations! You passed!

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Go to next item

1. In terms of the $\hat{x}_s, \hat{y}_s, \hat{z}_s$ coordinates of a fixed space frame {s}, the frame {a} has its \hat{x}_a -axis pointing in the direction (0,0,1) and its \hat{y}_b -axis pointing in the direction (1,0,0), and the frame {b} has its \hat{x}_b -axis pointing in the direction (1,0,0) and its \hat{y}_b -axis pointing in the direction (0,0,-1). Draw the {s}, {a}, and {b} frames, similar to examples in the book and videos (e.g., Figure 3.7 in the book), for easy reference in this question and later questions.

1/1 point

Write the rotation matrix $R_{\it sa}$. All elements of this matrix should be integers.

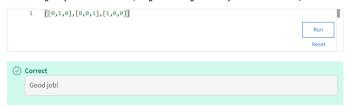
If your answer is

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

for example, you should just type

[[1,2,3],[4,5,6],[7,8,9]]

in the answer box below. (You can just modify the matrix that is currently written there.) Then click "Run." You will not get any immediate feedback; the grade will be given when you submit the whole quiz.



2. Referring to your drawing from Question 1, write R_{sb}^{-1} . All elements of this matrix should be integers.

1/1 point

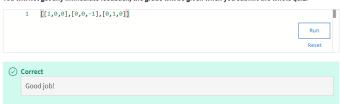
If your answer is

$$\left[\begin{array}{cccc} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{array}\right]$$

you should just type

[[1,2,3],[4,5,6],[7,8,9]]

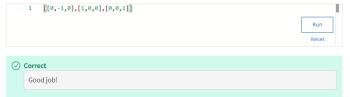
in the answer box below. (You can just modify the matrix that is currently written there.) Then click "Run." You will not get any immediate feedback; the grade will be given when you submit the whole quiz.



3. Referring to your drawing from Question 1, write R_{ab} . All elements of this matrix should be integers.

1/1 point

Write your matrix in the answer box below, using the format mentioned in questions 1 and 2, and click "Run."



4. Referring back to Question 1, let $R=R_{sb}$ be considered as a transformation operator consisting of a rotation about \hat{x} by -90° . Calculate $R_1=R_{sa}R$, and think of R_{sa} as the representation of the initial orientation of (a) relative to (s), R as a rotation operation, and R_1 as the new orientation of (a) after performing the rotation. The new orientation R_1 corresponds to the orientation of the new (a) frame relative to (s) after rotating the original (a) frame by -90° about which axis?

1 / 1 point

igodeligap The \hat{x}_{a} -axis of the {a} frame.

 \bigcirc The \hat{x}_{s} -axis of the {s} frame.



If your answer is $\begin{bmatrix} \frac{1}{2} \\ \frac{1}{3} \end{bmatrix}$ you should enter [1,2,3] In the text box below and click "Run." $\begin{bmatrix} \frac{1}{2} \\ \frac{1}{3} \end{bmatrix}$ In the text box below and click "Run." $\begin{bmatrix} \frac{1}{2} \\ \frac{1}{3} \end{bmatrix} \begin{bmatrix} \frac{1}{3} \\ \frac{1}{3} \end{bmatrix} \begin{bmatrix} \frac$	Referring back to Question 1, use R_{sb} to change the representation of the point $p_b=(1,2,3)^\intercal$ (in $\{b\}$ coordinates) to $\{s\}$ coordinates. All elements of this vector should be integers.	1 / 1 point
you should enter [1,2,3] in the text box below and click "Run." 2		
you should enter [1,2,3] in the text box below and click "Run." Correct Good job! Referring back to Question 1, choose a point p represented by $p_0 = (1,2,3)^{n}$ in [s] coordinates. Calculate $q = R_0^2 p_0$, is q a representation of p in [b] coordinates? No. No. Correct		
In the test box below and click "Run." Correct Good job!		
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in the text box below and click "Run." Correct Good job!	you should enter	
Selection back to Question 1, choose a point p represented by p _x = (1, 2, 3) ² in (s) coordinates. Calculate q = R ² _x p _x , is q a representation of p in (b) coordinates? (a) Yes. No. (b) Correct Referring back to Question 1, an angular velocity to its represented in (s) as ω _x = (3, 2, 1) [†] . What is its representation ω _x ? All elements of this vector should be integers. If your answer is [1] 2 3 you should enter [1,2,3] In the test box below and click "Run." 2 [1,3,2] Referring back to Question 1, calculate the matrix logarithm [ω] θ of R _{xx} , by hand, (You may verify your answer with softwares) Extract and enter the rotation amount θ in radians with at least two decinal places. 2 1 2 appint 2 2 appint (c) Correct Cood job! Calculate the matrix exponential corresponding to the exponential coordinates of rotation ωθ = (1, 2, 0) [†] . The maximum allowable error for any matrix element is 0,1 to give enough decimal places where necessary. Write your matrix in the answer box below, using the format mentioned in questions 1 and 2, and click "Run." 2 [1 -0.25, 0.65, 0.70], [0.65, 0.69, -0.35], [-0.70, 0.35, -0.62]] (a) Correct Good job! 2 Appint 2 [1 -0.25, 0.65, 0.70], [0.65, 0.69, -0.35], [-0.70, 0.35, -0.62]] (a) Correct Good job!	[1,2,3]	
Referring back to Question 1, choose a point p represented by $p_a = (1, 2, 3)^a$ in [s] coordinates. Calculate $q = R_{ii}^a p_a$, $b = 0$ a representation of p in (b) coordinates? (a) Yes. No. Correct Referring back to Question 1, an angular velocity to its represented in [s] as $\omega_a = (3, 2, 1)^a$. What is its representation ω_a ? All elements of this vector should be integers. If your answer is [1,2,3] In the text box below and click "Sun." (a) Correct Correct Correct Correct Coord job! Referring back to Question 1, calculate the matrix logarithm $ \omega \theta$ of R_{iia} by hand, (You may verify your answer with software.) Extract and enter the rotation amount θ in radians with at least two decimal places. (b) Correct Coord job! Calculate the matrix exponential corresponding to the exponential coordinates of rotation $\omega \theta = (1, 2, 0)^a$. The maximum allowable error for any matrix element is 0.01, so give enough decimal places where necessary. Write your matrix in the answer box below, using the format mentioned in questions 1 and 2, and click "Run." (c) Correct Coord job! Calculate the matrix exponential corresponding to the exponential coordinates of rotation $\omega \theta = (1, 2, 0)^a$. The maximum allowable error for any matrix element is 0.01, so give enough decimal places where necessary. Write your matrix in the answer box below, using the format mentioned in questions 1 and 2, and click "Run." (c) Correct Coord job! Correct Coord job!	in the text box below and click "Run."	
Referring back to Question 1, choose a point p represented by $p_a = (1, 2, 3)^T$ in $\{s\}$ coordinates. Calculate $q = R_{i_{p_a}}^t$, b_i a representation of p in $\{b\}$ coordinates? Yes. No. Correct Referring back to Question 1, an angular velocity at is represented in $\{g\}$ as $\omega_a = (3, 2, 1)^T$. What is its representation ω_a ? All elements of this vector should be integers. If your answer is $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ you should enter $\begin{bmatrix} 1,2,3 \end{bmatrix}$ In the text box below and click "Run." Referring back to Question 1, calculate the matrix logarithm $[\omega]\theta$ of R_{in_i} by hand. (You may verify your answer with software.) Extract and enter the rotation amount θ in radians with at least two decimal places. 1 2.09 Referring back to question 1, calculate the matrix logarithm $[\omega]\theta$ of R_{in_i} by hand. (You may verify your answer with software.) Extract and enter the rotation amount θ in radians with at least two decimal places. 2 Correct Good job! Calculate the matrix exponential corresponding to the exponential coordinates of rotation $\omega\theta = (1, 2, 0)^T$. The maximum allowable error for any matrix element is 0.01, so give enough decimal places where necessary. Write your matrix in the answer box below, using the format mentioned in questions 1 and 2, and click "Run." 1 [1-0.25, 0.65, 0.70], [0.65, 0.66, 0.35], [-0.70, 0.35, -0.62]] Referring back to Question 1, calculate the matrix corresponding to $\omega = (1, 2, 0.5)^T$. Confirm your answer using the 4.14 point where the coordinates of rotation ω and ω are the confirmation of the confirmation of the coordinates of rotation ω and ω are the confirmation of the coordinates of rotation ω and ω are the confirmation of the coordinates of rotation ω and ω are the confirmation of the coordinates of rotation ω and ω are the confirmation of the coordinates of rotation ω and ω are the confirmation of the coordinates of rotation ω and ω are the coordinates of rotation ω and ω are the coordinates of rotation ω and ω are the	1 [1,3,-2]	
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		1/1 point
Referring back to Question 1, an angular velocity w is represented in $[s]$ as $\omega_s = (3,2,1)^T$. What is its representation ω_s ? All elements of this vector should be integers. If your answer is $\begin{bmatrix} \frac{1}{2} \\ 3 \end{bmatrix}$ you should enter $[1,2,3]$ in the text box below and click "Run." $\begin{bmatrix} 1 & [s,3,2] \\ & & \\ &$		
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Referring back to Question 1, calculate the matrix logarithm $[\omega]\theta$ of R_{so} by hand. (You may verify your answer with software.) Extract and enter the rotation amount θ in radians with at least two decimal places. 1 2.09 Run Reset Correct Good job! Calculate the matrix exponential corresponding to the exponential coordinates of rotation $\omega\theta = (1, 2, 0)^{T}$. The maximum allowable error for any matrix element is 0.01, so give enough decimal places where necessary. Write your matrix in the answer box below, using the format mentioned in questions 1 and 2, and click "Run." 1 [[-0.29,0.65,0.70],[0.65,0.68,-0.35],[-0.70,0.35,-0.62]] Run Reset • Correct Good job!		
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"Run."	Referring back to Question 1, calculate the matrix logarithm $[\hat{\omega}]\theta$ of R_{sa} by hand. (You may verify your answer with software.) Extract and enter the rotation amount θ in radians with at least two decimal places. 1 2.09 Run Reset Correct Good job!	
$ \begin{array}{c} 1 & \hbox{ [[-0.29,0.65,0.70],[0.65,0.68,-0.35],[-0.70,0.35,-0.62]]} \\ & \hbox{ Run } \\ & \hbox{ Reset} \end{array} $	Referring back to Question 1, calculate the matrix logarithm $[\hat{\omega}]\theta$ of R_{sa} by hand. (You may verify your answer with software.) Extract and enter the rotation amount θ in radians with at least two decimal places. $\begin{array}{cccccccccccccccccccccccccccccccccccc$	1/1 point 1/1 point
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Reset \bigcirc Correct \bigcirc Good job!	Referring back to Question 1, calculate the matrix logarithm $[\hat{\omega}]\theta$ of R_{sa} by hand. (You may verify your answer with software.) Extract and enter the rotation amount θ in radians with at least two decimal places. $\begin{array}{ccc} 1 & 2.09 & & \\ \hline & & \\$	
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Good job! $\textbf{D}. \ \text{Write the } 3\times3 \ \text{skew-symmetric matrix corresponding to} \ \omega = (1,2,0.5)^\intercal. \ \text{Confirm your answer using the}$	Referring back to Question 1, calculate the matrix logarithm $[\hat{\omega}]\theta$ of R_{sa} by hand. (You may verify your answer with software.) Extract and enter the rotation amount θ in radians with at least two decimal places. 1 2.09 Run Reset Correct Good job! Calculate the matrix exponential corresponding to the exponential coordinates of rotation $\hat{\omega}\theta = (1,2,0)^{\rm T}$. The maximum allowable error for any matrix element is 0.01, so give enough decimal places where necessary. Write your matrix in the answer box below, using the format mentioned in questions 1 and 2, and click "Run."	
Good job! $\textbf{D}. \ \text{Write the } 3\times3 \ \text{skew-symmetric matrix corresponding to} \ \omega = (1,2,0.5)^\intercal. \ \text{Confirm your answer using the}$	Referring back to Question 1, calculate the matrix logarithm $[\hat{\omega}]\theta$ of R_{sa} by hand. (You may verify your answer with software.) Extract and enter the rotation amount θ in radians with at least two decimal places. 1 2.09 Run Reset Correct Good job! Calculate the matrix exponential corresponding to the exponential coordinates of rotation $\hat{\omega}\theta = (1,2,0)^{\rm T}$. The maximum allowable error for any matrix element is 0.01, so give enough decimal places where necessary. Write your matrix in the answer box below, using the format mentioned in questions 1 and 2, and click "Run."	
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tunction Mac Laga X in the given coffware	Referring back to Question 1, calculate the matrix logarithm $[\hat{\omega}]\theta$ of R_{sa} by hand. (You may verify your answer with software.) Extract and enter the rotation amount θ in radians with at least two decimal places. 1 2.09 Run Reset Correct Good job! Calculate the matrix exponential corresponding to the exponential coordinates of rotation $\hat{\omega}\theta = (1,2,0)^{\rm T}$. The maximum allowable error for any matrix element is 0.01, so give enough decimal places where necessary. Write your matrix in the answer box below, using the format mentioned in questions 1 and 2, and click "Run." 1 [[-0.29,0.65,0.70],[0.65,0.68,-0.35],[-0.70,0.35,-0.62]] Run Reset	

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1 [[0,-0.5,2],[0.5,0,-1],[-2,1,0]]



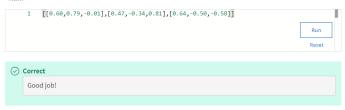
11. Use the function ${\tt MatrixExp3}$ in the given software to calculate the rotation matrix $R\in SO(3)$ corresponding to the matrix exponential of

1/1 point

$$[\hat{\omega}]\theta = \left[\begin{array}{ccc} 0 & 0.5 & -1 \\ -0.5 & 0 & 2 \\ 1 & -2 & 0 \end{array} \right].$$

The maximum allowable error for any matrix element is 0.01, so give enough decimal places where necessary.

Write your matrix in the answer box below, using the format mentioned in questions 1 and 2, and click "Run."



12. Use the function $exttt{MatrixLog3}$ in the given software to calculate the matrix logarithm $[\hat{\omega}]\theta \in so(3)$ of rotation matrix

1 / 1 point

$$R = \left[\begin{array}{ccc} 0 & 0 & 1 \\ -1 & 0 & 0 \\ 0 & -1 & 0 \end{array} \right].$$

The maximum allowable error for any matrix element is 0.01, so give enough decimal places where necessary.

Write your matrix in the answer box below, using the format mentioned in questions 1 and 2, and click "Run."

