1. **Question Details**

Compute the derivatives of each of the following vector valued functions.

\[ \mathbf{r}(t) = (\cos(2t), \sin(2t)) \]
\[ \mathbf{r}'(t) = \]

\[ \mathbf{r}(t) = (t^2 - 1, t^3 - 2t + 1) \]
\[ \mathbf{r}'(t) = \]

\[ \mathbf{r}(t) = (t, 6e^{t/3}) \]
\[ \mathbf{r}'(t) = \]

\[ \mathbf{r}(t) = (\ln(t), e^{-1}) \]
\[ \mathbf{r}'(t) = \]

2. **Question Details**

The derivative \( \mathbf{r}'(t) \) or \( \frac{d\mathbf{r}}{dt} \) of a vector valued function \( \mathbf{r}(t) \) is computed by taking the derivatives of each of the components of \( \mathbf{r}(t) \).

Which of the following is the derivative of \( \mathbf{r}(t) = (t, e^{2t})? \)

- \( \mathbf{r}'(t) = (1, 2e^{2t}) \)
- \( \mathbf{r}'(t) = (1, e^{2t}) \)
- \( \mathbf{r}'(t) = (1, \frac{1}{2}e^{2t}) \)
Download and complete Worksheet #2. If you are working in class, get a copy from your instructor. After you complete the worksheet, answer these questions.

What is the component form of the vector $\mathbf{v}_0$?

In your sketch, at what point did you base your sketch of $\mathbf{v}_0$?

What is the component form of the vector $\mathbf{v}_1$?

In your sketch, at what point did you base your sketch of $\mathbf{v}_1$?
Suppose \( \mathbf{r}(t) = \langle \cos(t), \sin(t) \rangle \). For each of the following, select the letter of the correct diagram.

- Which diagram shows \( \mathbf{r}(0) \)?
- Which diagram shows \( \mathbf{r}'(0) \)?
Suppose \( \mathbf{r}(t) = (\cos(2t), \sin(2t)) \). Which of the following diagrams correctly displays \( \mathbf{r}'(0) \)?
Suppose $\mathbf{r}(t) = \langle \cos(t/2), \sin(t/2) \rangle$. Which of the following diagrams correctly displays $\mathbf{r}'(\pi/2)$?
Suppose \( \mathbf{r}(t) = (t^2 - 1, -t) \). Which of the following diagrams correctly displays \( \mathbf{r}'(-1) \)?
In the following diagrams, suppose the curve is parameterized by a vector valued function \( \vec{r}(t) \).
In which of the diagrams is it impossible for the pictured vector \( \vec{v} \) to be the derivative of \( \vec{r} \) at the indicated point?

Select all that apply.
Consider the given vector equation.

\( \mathbf{r}(t) = (3t - 2, t^2 + 4) \)

(a) Find \( \mathbf{r}'(t) \).

\[ \mathbf{r}'(t) = \]

(b) Sketch the plane curve together with the position vector \( \mathbf{r}(t) \) and the tangent vector \( \mathbf{r}'(t) \) for the given value of \( t = 2 \).
Consider the given vector equation.
\[ \mathbf{r}(t) = (e^{10t}, e^5) \]

(a) Find \( \mathbf{r}'(t) \).

(b) Sketch the plane curve together with position vector \( \mathbf{r}(t) \) and the tangent vector \( \mathbf{r}'(t) \) for the given value of \( t = 0 \).

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Consider the given vector equation.
\[ \mathbf{r}(t) = (4 \sin(t), -3 \cos(t)) \]

(a) Find \( \mathbf{r}'(t) \).

(b) Sketch the plane curve together with position vector \( \mathbf{r}(t) \) and the tangent vector \( \mathbf{r}'(t) \) for the given value of \( t = 3\pi/4 \).
Four students are given \( \vec{r}'(t) = \langle 3t^2, 4t \rangle \) and asked to come up with a formula for \( \vec{r}(t) \).
Each student’s attempt is shown below. Check each student’s answer by computing its derivative.
Then decide if the student was CORRECT or INCORRECT.

**Alice** says: \( \vec{r}(t) = \langle t^3, 2t^2 \rangle \). Check: \( \vec{r}'(t) = \)

Was Alice correct or incorrect?
- \( \square \) Correct
- \( \square \) Incorrect

**Bob** says: \( \vec{r}(t) = \langle 6t, 4 \rangle \). Check: \( \vec{r}'(t) = \)

Was Bob correct or incorrect?
- \( \square \) Correct
- \( \square \) Incorrect

**Chris** says: \( \vec{r}(t) = \langle 5 + t^3, 2t^2 \rangle \). Check: \( \vec{r}'(t) = \)

Was Chris correct or incorrect?
- \( \square \) Correct
- \( \square \) Incorrect

**Dany** says: \( \vec{r}(t) = \langle t^3, 2t^2 - 10 \rangle \). Check: \( \vec{r}'(t) = \)

Was Dany correct or incorrect?
- \( \square \) Correct
- \( \square \) Incorrect

True or False? There can be more than one right answer for \( \vec{r}(t) \).
- \( \square \) True
- \( \square \) False
Suppose \( \mathbf{r}'(t) = (t, 6t^2) \). Which of the following could be \( \mathbf{r}(t) \)? Select all that apply.

- \( \mathbf{r}(t) = \left\{ \frac{1}{2}t^2 - \frac{1}{40}, 2t^3 \right\} \)
- \( \mathbf{r}(t) = \left\{ \frac{1}{2}t^2, 2t^3 \right\} \)
- \( \mathbf{r}(t) = \left\{ 1 + \frac{1}{2}t^2, 2t^3 \right\} \)
- \( \mathbf{r}(t) = \left\{ \frac{1}{2}t^2, 12t \right\} \)
- \( \mathbf{r}(t) = \left\{ \frac{1}{2}t^2 - 1, 2t^3 + 5 \right\} \)
- \( \mathbf{r}(t) = \left\{ 1, 12t \right\} \)
- \( \mathbf{r}(t) = \left\{ 1, 2t^3 \right\} \)

Suppose \( \mathbf{r}'(t) = (\cos t, \sin t) \). Which of the following could be \( \mathbf{r}(t) \)? Select all that apply.

- \( \mathbf{r}(t) = \left\{ -\sin(t) + 1, \cos(t) - 1 \right\} \)
- \( \mathbf{r}(t) = \left\{ -\sin(t), \cos(t) \right\} \)
- \( \mathbf{r}(t) = \left\{ 1 + \sin(t), 1 - \cos(t) \right\} \)
- \( \mathbf{r}(t) = \left\{ \sin(t), -\cos(t) \right\} \)
- \( \mathbf{r}(t) = \left\{ \sin(t + 1), -\cos(t - 1) \right\} \)
Suppose \( \vec{r}'(t) = (-\sin(t), \cos(t)) \).

Find \( \vec{r}(t) \) so that \( \vec{r}(0) = (1, 0) \).

\[ \vec{r}(t) = \] ____________

Choose the diagram that represents \( \vec{r}(t) \).
Suppose \( \vec{r}'(t) = (-\sin(t), \cos(t)) \).

Find \( \vec{r}(t) \) so that \( \vec{r}(0) = (2, 1) \).

\[
\vec{r}(t) = \quad \quad \quad \quad \\
\]

Choose the diagram that represents \( \vec{r}(t) \).
Suppose \( \mathbf{r}'(t) = (-\sin(t), \cos(t)) \).

Find \( \mathbf{r}(t) \) so that \( \mathbf{r}(0) = (0, 0) \).

\[ \mathbf{r}(t) = \] choose one of the diagrams that represents \( \mathbf{r}(t) \).
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Suppose \( \mathbf{r}'(t) = (-\sin(t), \cos(t)) \).

Find \( \mathbf{r}(t) \) so that \( \mathbf{r}(0) = (-1, 1) \).

Choose the diagram that represents \( \mathbf{r}(t) \).

19. Question Details

Suppose \( \mathbf{r}'(t) = (e^{3t}, 1) \). Find \( \mathbf{r}(t) \) so that \( \mathbf{r}(0) = (1, 0) \).

20. Question Details

Find \( \mathbf{r}(t) \) if \( \mathbf{r}'(t) = \left(6t^5, 7t^6, \sqrt{t}\right) \) and \( \mathbf{r}(1) = (1, 1, 0) \).