No calculators will be allowed and no partial credit will be given.

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1. Find the derivative of the vector function $\vec{\mathbf{r}}(t) = \langle \cos(t), 2t^2, t^3 \rangle$

2. Find the derivative of the vector function $\vec{\mathbf{r}}(t) = \langle \dfrac{5\,e^t}{2}, \ln(2t), t^4 + \dfrac{3}{t^2} \rangle$

3. A space curve C is described by the vector function $\vec{\mathbf{r}}(t) = \langle t^2, \dfrac{t^2}{2}, t^3 \rangle$. Find $\vec{\mathbf{T}}(1)$, the unit tangent vector to C at the point corresponding to $t = 1$.

4. A space curve C is described by the vector function $\vec{\mathbf{r}}(t) = \langle 4 \ln(t), 2\sqrt{t}, \dfrac{1}{t} \rangle$. Find $\vec{\mathbf{T}}(1)$, the unit tangent vector to C at the point corresponding to $t = 1$.

5. A space curve C is described by the vector function $\vec{\mathbf{r}}(t) = \langle \cos(t), 3\sin(t), -3 \rangle$. Find $\vec{\mathbf{T}}(\dfrac{\pi}{3})$, the unit tangent vector to C at the point corresponding to $t = \dfrac{\pi}{3}$.

6. Express the indefinite integral $\displaystyle\int \langle 3\cos(t), 3t^2, (\sec(t))^2 \rangle \, dt$ as a vector of elementary functions. Use the constant vector $\langle C1, C2, C3 \rangle$ to denote arbitary constants of integration.

7. Express the indefinite integral $\displaystyle\int \langle t^3 + t^{\frac{3}{2}}, e^{3t}, \dfrac{3}{t} \rangle \, dt$ as a vector of elementary functions. Use the constant vector $\langle C1, C2, C3 \rangle$ to denote arbitary constants of integration.

8. Find $\vec{\mathbf{r}}(t)$ given $\vec{\mathbf{r}}'(t) = \langle 2\sin(t), t^3, -2t^2 \rangle$ and $\vec{\mathbf{r}}(0) = \langle -1, 0, 4 \rangle$

9. Find $\vec{\mathbf{r}}(t)$ given $\vec{\mathbf{r}}'(t) = \langle \dfrac{6t}{t^2+1}, t^3 + 2t, -2\left(t^2 - t\right) \rangle$ and $\vec{\mathbf{r}}(0) = \langle -2, 4, 3 \rangle$

10. Find $\vec{\mathbf{r}}(t)$ given $\vec{\mathbf{r}}'(t) = \langle 2\cos(t), \sin(t), 0 \rangle$ and $\vec{\mathbf{r}}(\pi) = \langle 2, -1, 3 \rangle$

1. $\langle -\sin(t), 4\,t, 3\,t^2 \rangle$

2. $\langle \dfrac{5\,e^t}{2}, \dfrac{1}{t}, 4\,t^3 - \dfrac{6}{t^3} \rangle$

3. $\langle \dfrac{2}{\sqrt{14}}, \dfrac{1}{\sqrt{14}}, \dfrac{3}{\sqrt{14}} \rangle$

4. $\langle \dfrac{2\sqrt{2}}{3}, \dfrac{1}{3\sqrt{2}}, -\dfrac{1}{3\sqrt{2}} \rangle$

5. $\langle -\dfrac{1}{2}, \dfrac{3}{2\sqrt{3}}, 0 \rangle$

6. $\langle 3\sin(t), t^3, \tan(t) \rangle + \langle C1, C2, C3 \rangle$

7. $\langle \dfrac{t^4}{4} + \dfrac{2\,t^{\frac{5}{2}}}{5}, \dfrac{e^{3\,t}}{3}, 3\ln(|t|) \rangle + \langle C1, C2, C3 \rangle$

8. $\langle 1 - 2\cos(t), \dfrac{t^4}{4}, 4 - \dfrac{2\,t^3}{3} \rangle$

9. $\langle 3\ln(t^2 + 1) - 2, \dfrac{t^4}{4} + t^2 + 4, 3 - 2\left(\dfrac{t^3}{3} - \dfrac{t^2}{2}\right) \rangle$

10. $\langle 2\sin(t) + 2, -\cos(t) - 2, 3 \rangle$