

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

1. Find the derivative of the vector function $\vec{r}(t) = \langle \cos(t), \frac{4}{t}, t^3 \rangle$
2. Find the derivative of the vector function $\vec{r}(t) = \langle \frac{3e^t}{2}, \ln(3t), t^2 + \frac{3}{t^2} \rangle$
3. A space curve C is described by the vector function $\vec{r}(t) = \langle t^2, \frac{t}{2}, t^2 \rangle$. Find $\vec{T}(1)$, the unit tangent vector to C at the point corresponding to $t = 1$.
4. A space curve C is described by the vector function $\vec{r}(t) = \langle 3 \ln(t), 2\sqrt{t}, t \rangle$. Find $\vec{T}(1)$, the unit tangent vector to C at the point corresponding to $t = 1$.
5. A space curve C is described by the vector function $\vec{r}(t) = \langle \cos(t), 4 \sin(t), 2t \rangle$. Find $\vec{T}(-\frac{\pi}{2})$, the unit tangent vector to C at the point corresponding to $t = -\frac{\pi}{2}$.
6. Express the indefinite integral $\int \langle 2 \sin(t), 2t^3, \sqrt{t} \rangle dt$ as a vector of elementary functions. Use the constant vector $\langle C1, C2, C3 \rangle$ to denote arbitrary constants of integration.
7. Express the indefinite integral $\int \langle t^2 + t, e^{2t}, 3e^t \rangle dt$ as a vector of elementary functions. Use the constant vector $\langle C1, C2, C3 \rangle$ to denote arbitrary constants of integration.
8. Find $\vec{r}(t)$ given $\vec{r}'(t) = \langle \sin(t), e^t, -2t^2 \rangle$ and $\vec{r}(0) = \langle -1, -2, 3 \rangle$
9. Find $\vec{r}(t)$ given $\vec{r}'(t) = \langle \frac{t}{t^2 + 1}, t^2 - t, -2(t^3 + 2t) \rangle$ and $\vec{r}(0) = \langle -2, -2, 3 \rangle$
10. Find $\vec{r}(t)$ given $\vec{r}'(t) = \langle \sin(t), 0, -2 \cos(t) \rangle$ and $\vec{r}(\pi) = \langle 2, -1, 3 \rangle$

1. $\langle -\sin(t), -\frac{4}{t^2}, 3t^2 \rangle$
2. $\langle \frac{3e^t}{2}, \frac{1}{t}, 2t - \frac{6}{t^3} \rangle$
3. $\langle \frac{4}{\sqrt{33}}, \frac{1}{\sqrt{33}}, \frac{4}{\sqrt{33}} \rangle$
4. $\langle \frac{3}{\sqrt{11}}, \frac{1}{\sqrt{11}}, \frac{1}{\sqrt{11}} \rangle$
5. $\langle \frac{1}{\sqrt{5}}, 0, \frac{2}{\sqrt{5}} \rangle$
6. $\langle -2 \cos(t), \frac{t^4}{2}, \frac{2t^{\frac{3}{2}}}{3} \rangle + \langle C1, C2, C3 \rangle$
7. $\langle \frac{t^3}{3} + \frac{t^2}{2}, \frac{e^{2t}}{2}, 3e^t \rangle + \langle C1, C2, C3 \rangle$
8. $\langle -\cos(t), e^t - 3, 3 - \frac{2t^3}{3} \rangle$
9. $\langle \frac{\ln(t^2 + 1)}{2} - 2, \frac{t^3}{3} - \frac{t^2}{2} - 2, 3 - 2 \left(\frac{t^4}{4} + t^2 \right) \rangle$
10. $\langle 1 - \cos(t), -1, 3 - 2 \sin(t) \rangle$