

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

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

1. $\langle -\sin(t), -\frac{6}{t^2}, 3t^2 \rangle$
2. $\langle 5t, 4e^{4t}, 4t^3 - \frac{6}{t^3} \rangle$
3. $\langle \frac{2}{\sqrt{6}}, \frac{1}{\sqrt{6}}, \frac{1}{\sqrt{6}} \rangle$
4. $\langle \frac{8}{\sqrt{89}}, \frac{3}{\sqrt{89}}, \frac{4}{\sqrt{89}} \rangle$
5. $\langle -\frac{2\sqrt{3}}{\sqrt{57}}, \frac{3}{\sqrt{57}}, \frac{6}{\sqrt{57}} \rangle$
6. $\langle 3 \sin(t), -\frac{3}{2t^2}, \frac{2t^{\frac{3}{2}}}{3} \rangle + \langle C1, C2, C3 \rangle$
7. $\langle \frac{t^4}{4} + \frac{2t^{\frac{5}{2}}}{5}, \frac{e^{3t}}{3}, 2e^t \rangle + \langle C1, C2, C3 \rangle$
8. $\langle \sin(t) - 1, e^t - 1, 3e^t + 1 \rangle$
9. $\langle \ln(t^2 + 1) - 2, \frac{t^4}{4} + t^2 + 4, 9t \rangle$
10. $\langle \sin(t) + 1, -\cos(t) - 1, 1 \rangle$