Vector Valued Functions (Section 9) **Version E**
Rensselaer Calculus Skills Practice Page

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

---

1. Find the derivative of the vector function $\vec{\mathbf{r}}(t) = \langle \cos(t), 4\sqrt{t}, \tan(t) \rangle$
2. Find the derivative of the vector function $\vec{\mathbf{r}}(t) = \langle \frac{7t^2}{2}, \ln(3t), t^6 + \sqrt{t} \rangle$
3. A space curve C is described by the vector function $\vec{\mathbf{r}}(t) = \langle t^2, \frac{t^3}{3}, t^2 \rangle$. 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 $\vec{\mathbf{r}}(t) = \langle 2\ln(t), 4\sqrt{t}, t^2 \rangle$. Find $\vec{\mathbf{T}}(4)$, the unit tangent vector to C at the point corresponding to $t = 4$.
5. A space curve C is described by the vector function $\vec{\mathbf{r}}(t) = \langle -\cos(t), 3\sin(t), 3 \rangle$. Find $\vec{\mathbf{T}}(\frac{\pi}{4})$, the unit tangent vector to C at the point corresponding to $t = \frac{\pi}{4}$.
6. Express the indefinite integral $\int \langle 2\sin(t), \frac{4}{t^3}, (\sec(t))^2 \rangle \, dt$ 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 $\int \langle t + \sqrt{t}, e^{4t}, \frac{3}{t} \rangle \, dt$ 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 $\vec{\mathbf{r}}'(t) = \langle \cos(t), e^t, 3t^2 \rangle$ and $\vec{\mathbf{r}}(0) = \langle 2, 0, 3 \rangle$
9. Find $\vec{\mathbf{r}}(t)$ given $\vec{\mathbf{r}}'(t) = \langle \frac{3t}{t^2+1}, 3, 3\left(t^3 + 2t\right) \rangle$ and $\vec{\mathbf{r}}(0) = \langle -2, -2, 0 \rangle$
10. Find $\vec{\mathbf{r}}(t)$ given $\vec{\mathbf{r}}'(t) = \langle \cos(t), \sin(t), 0 \rangle$ and $\vec{\mathbf{r}}(\frac{3\pi}{2}) = \langle 2, -2, 3 \rangle$

Vector Valued Functions (Section 9) **Version E**
Answer Key Rensselaer Calculus Skills Practice Page, Fall 2007

---

1. $\langle -\sin(t), \frac{2}{\sqrt{t}}, (\sec(t))^2 \rangle$
2. $\langle 7\,t, \frac{1}{t}, 6\,t^5 + \frac{1}{2\sqrt{t}} \rangle$
3. $\langle \frac{2}{3}, \frac{1}{3}, \frac{2}{3} \rangle$
4. $\langle \frac{1}{3\sqrt{29}}, \frac{2}{3\sqrt{29}}, \frac{16}{3\sqrt{29}} \rangle$
5. $\langle \frac{1}{\sqrt{2}\sqrt{5}}, \frac{3}{\sqrt{2}\sqrt{5}}, 0 \rangle$
6. $\langle -2\cos(t), -\frac{2}{t^2}, \tan(t) \rangle + \langle C1, C2, C3 \rangle$
7. $\langle \frac{t^2}{2} + \frac{2\,t^{\frac{3}{2}}}{3}, \frac{e^{4\,t}}{4}, 3\ln(|t|) \rangle + \langle C1, C2, C3 \rangle$
8. $\langle \sin(t) + 2, e^t - 1, t^3 + 3 \rangle$
9. $\langle \frac{3\ln(t^2+1)}{2} - 2, 3\,t - 2, 3\left(\frac{t^4}{4} + t^2\right) \rangle$
10. $\langle \sin(t) + 3, -\cos(t) - 2, 3 \rangle$