Calculus 3 June 20, 2016

1. Find $\vec{r}'(t)$, when $\vec{r}(t) = \left\langle \cos(t), 3e^{t^2}, t^4 \sin(t) \right\rangle$

2. Let $\vec{u}(t) = \left\langle t^2, \ln(t), \frac{t}{4+t} \right\rangle$ and $\vec{s}(t) = \langle \cos(t), t^3, 2t+8 \rangle$, find $(\vec{u} \cdot \vec{s})'$

3. Find $(\vec{u} \times \vec{s})'$

4. Let $f(t) = e^t$, find $(f(t)\vec{r}(t))'$

5. Let $\vec{r}(t) = \langle e^t \cos(t), t+10, 5 \rangle$, find $\vec{r}'(t)$

6. Find $\vec{r}''(t)$

7. Find $\vec{r}' \times \vec{r}''$

8. Find $\vec{T}(0)$

9. Let $\vec{s}(t) = < \cos(t), t^3, 2t+8 >$, find $\int_0^1 \vec{s}(t)dt$

10. Let $\vec{s}(t) = < t^2, \frac{2}{3}t^3, t >$
    (a) Find $\vec{T}(t)$
    (b) Find $\vec{N}(t)$
    (c) Find $\vec{B}(t)$
    (d) Find the normal and osculating planes at $t = 1$
    (e) Find the curvature at $t = 1$ as well

11. Find the curvature of $\vec{u}(t) = < t^2, \ln(t), \frac{t}{4+t} >$ at $t = 1$

12. Find the arclength of the helix $\vec{r}(t) = < \cos(t), \sin(t), t >$, between $-3 < t < 4$.

13. Reparameterize the helix in terms of arclength

14. Find the arclength parameterization of $\vec{m}(t) = < t^2, \frac{8}{3}t^{3/2}, 4t >$

15. Find arclength of the curve between $0 < t < 5$

16. Find the curvature of the above curve at $t = 0$