Analytic Geometry and Calculus III (22005 Section 002)
HW1, due Friday, September 9
Instructor: Prof. Artem Zvavitch

Problem 1. *Consider vectors* $\mathbf{a} = (1, -2, 1)$ *and* $\mathbf{b} = (0, 1, -1)$. *Find*

- $|3\mathbf{a} - 2\mathbf{b}|$
- $\mathbf{a} \cdot \mathbf{b}$
- $\mathbf{a} \times \mathbf{b}$

Problem 2. *Let* $\mathbf{r}(t) = (3t, \frac{te^t}{\sin t}, \cos t)$. *Find* $\lim_{t \to 0} \mathbf{r}(t)$.

Problem 3. *Let* $\mathbf{r}(t) = (3t, te^t, \cos t)$,

- *Find* $\mathbf{r}'(t)$.
- *Find unit tanget vector* $\mathbf{T}(0)$.
- *Find an equation of a tangent line to the curve defind by* $\mathbf{r}(t)$ *at* $t = 0$.
- *Find* $\int_0^\pi \mathbf{r}(t)$.

Problem 4. *Let* $\mathbf{r}(t) = (3t, \sin 6t, \cos 6t)$, $-6 \leq t \leq 7$.

- *Find the lenght of this curve.*
- *Find the unit tangent vector* $\mathbf{T}(t)$.
- *Find the curvature* $k(t)$.