Math 242: Calculus and Analytic Geometry III

Exam 1

February 16, 2016

NAME:

To receive full credit you must clearly show all work and justify your answers. No books, notes, or calculators are allowed during this exam. This is a 50 minute exam.

Question:	1	2	3	4	5	6	Total
Points:	20	10	15	10	15	0	70
Score:							

1. (a) (10 points) Consider the triangle ABC with vertices $A(0, -2, -2)$, $B(4, 2, -2)$ and $C(0, 0, 0)$. Find the angle inside the triangle at vertex A

   (b) (10 points) Find the plane that contains the $\triangle ABC$.

2. (10 points) Given the vector function $\vec{r}(t) = \langle 2\cos(t), \ln(t^2 + 1), 2\sin(t) \rangle$, find $\vec{T}(t)$.

3. Let $\vec{r}(t)$ be the vector function describing the intersection of the cylinder $x^2 + y^2 = 4$ and $z = x^2$.

   (a) (5 points) Find $\vec{r}(t)$.

   (b) (10 points) Find $\displaystyle\int_0^\pi \vec{r}(t)\, dt$.

4. (10 points) Let $\vec{a} = \langle a_1, a_2, a_3 \rangle$ and $\vec{b} = \langle b_1, b_2, b_3 \rangle$ be vectors. Show that $\vec{a} \times \vec{b}$ is orthogonal to $\vec{b}$.

5. Consider the curve $\vec{r}(t) = \langle \sin(\pi t), 5\sin(\pi t), \cos(\pi t) \rangle$

   (a) (10 points) Find parametric equations for the tangent lines of $\vec{r}(t)$ at $t = 0$ and $t = \frac{1}{2}$.

   (b) (5 points) Determine if the tangent lines found in part (a) are parallel, intersect, or skew.

6. (7 points (bonus)) Find an equation describing the set of all points *equidistant* (equal distance) from the points $A(-1, 5, 3)$ and $B(6, 2, -2)$. Describe the surface this set represents.