Math 2415 **Homework Set 1** **10 Points**

Functions of Several Variables

Identify the level curves and traces for each of the following. You don't need to sketch the graph just identify the type of curve (line, parabola, *etc*.)

1. $z = 2y^2 - 5x^2$

2. $7z + 6y^2 + 9x^2 - 2 = 0$

Vector Functions

For problems 3 – 5 write down the vector function for the given curve or surface.

3. $h(y) = 8\mathbf{e}^{1-y^2} - \sqrt{y}$

4. $y = x^4 + \sin(2x - 7z)$

5. A circle with radius 9 centered on the *y*-axis at $y = 8$

6. Find the vector equation of the line segment starting at $P = (2, 0, -7)$ and ending at $Q = (1, -1, 4)$.

7. Given $\vec{r}_u = (3u + v)\,\vec{i} - u^2\,\vec{k}$ and $\vec{r}_v = 2\vec{i} + v^3\vec{j} - 3u\vec{k}$ compute each of the following.

(a) $\vec{r}_u \bullet \vec{r}_v$ **(b)** $\vec{r}_u \times \vec{r}_v$ **(c)** $\left\|\vec{r}_u \times \vec{r}_v\right\|$

Yes, I realize we didn't do much (if any) of these in class. However, the dot product, cross product and magnitude are very important so dig back into your Calc II notes and recall how to do these!

Calculus with Vector Functions

8. Compute $\lim\limits_{t \to 2} \vec{r}(t)$ if $\vec{r}(t) = \mathbf{e}^{1-5t}\,\vec{i} + \dfrac{1 - \cos(t-2)}{t^2 - 4}\,\vec{j} - (6t^2 + t^3)\,\vec{k}$.

9. Find the derivative of $\vec{r}(t) = \left\langle \ln(8t^2 + 2), \dfrac{4t}{t^2 + 1}, 3t\cos(6t) \right\rangle$.

10. Compute $\int \vec{r}(t)\,dt$ for $\vec{r}(t) = \left\langle 9t^2, \sin^2(3t), t\cos(t) \right\rangle$.

Tangent and Normal Vectors

11. Find the tangent line to $\vec{r}(t) = (5 + 2t)\vec{i} + \tan(\pi t)\,\vec{j} + \mathbf{e}^{8-t}\vec{k}$ at $t = -1$.

12. Find the unit tangent and unit normal vectors for $\vec{r}(t) = \left\langle 7, \mathbf{e}^{-4t}\sin\left(\tfrac{t}{2}\right), \mathbf{e}^{-4t}\cos\left(\tfrac{t}{2}\right) \right\rangle$.