Math 251. WEEK in REVIEW 2. Fall 2013

1. Find the traces of the given surface in the planes $x = k$, $y = k$, $z = k$.

   (a) $y - x^2 - 9z^2 = 0$

   (b) $16x^2 - y^2 - z^2 = 9$

2. Sketch each of the following:

   (a) $y - x^2 - 9z^2 = 0$

   (b) $16x^2 - y^2 - z^2 = 9$

3. Identify the surface and make a rough sketch that shows its position and orientation

(a) $z = (x-1)^2 + (y+5)^2 + 7$

(b) $4x^2 - y^2 + (z-4)^2 = 20$

(c) $x^2 + y^2 + z + 6x - 2y + 10 = 0$

4. Find an equation of the surface generated by revolving the curve given by $y = 25x^2$ and $z = 0$ about the y axis.

5. Find the domain of $\vec{r}(t) =< \ln(4 - t^2), \sqrt{1+t}, \sin(\pi t) >$.

6. Find a vector equation for the curve of intersection of the surfaces $x = y^2$ and $z = x$ in terms of the parameter $y = t$.

7. Does the graph of the vector-function $\vec{r}(t) = \left\langle \frac{1-t^2}{t}, \frac{t+1}{t}, t \right\rangle$ lie in the plane $x - y + z = -1$?

8. Find the points where the curve $\vec{r}(t) =< 1-t, t^2, t^2 >$ intersects the plane $5x-y+2z = -1$.

9. Find parametric equations of the line tangent to the graph of $\vec{r}(t) =< e^{-t}, t^3, \ln t >$ at the point $t = 1$.

10. Find symmetric equations of the line tangent to the graph of $\vec{r}(t) = \left\langle t^2, 4 - t^2, -\frac{3}{1+t} \right\rangle$ at the point $(4, 0, 3)$.

11. Let

$$\vec{r}_1(t) =< \arctan t, t, -t^4 >$$

and

$$\vec{r}_2(t) = \left\langle t^2 - t, 2\ln t, \frac{\sin(2\pi t)}{2\pi} \right\rangle.$$

(a) Show that the graphs of the given vector-functions intersect at the origin.

(b) Find their angle of intersection at the origin.

12. Evaluate the integral $\int_1^4 \left(\sqrt{t}\vec{\imath} + te^{-t}\vec{\jmath} + \frac{1}{t^2}\vec{k} \right) dt$

13. A moving particle starts at an initial position $\vec{r}(0) =< 1, 0, 0 >$ with initial velocity $\vec{v}(0) = \vec{\imath} - \vec{\jmath} + \vec{k}$. Its acceleration is $\vec{a}(t) = 4t\vec{\imath} + 6t\vec{\jmath} + \vec{k}$. Find its velocity and position at time t.