Calculus 3 July 12, 2016

1. Sketch the following functions:
   (a) $\vec{r}(t) = \left\langle \cos^2(t), \sin^2(t), t \right\rangle$
   (b) $\vec{r}(t) = \left\langle t^2 - 1, t \right\rangle$
   (c) $\vec{r}(u, v) = \langle 2\cos(u), v, 2\sin(u) \rangle$
   (d) $\vec{r}(u, v) = \langle v\cos(u), v\sin(u), v \rangle$
   (e) $\vec{r}(t) = \langle \cos(t), \sin(t), 2 - \sin(t) \rangle$
   (f) $\vec{r}(u, v) = \langle u + v, 3 - v, 1 + 4u + 5v \rangle$

2. Find a parametric representation of the sphere
$$x^2 + y^2 + z^2 = 9$$

3. Find a parametric representation of the sphere, where $0 \leq z \leq 1$
$$x^2 + y^2 = 4$$

4. Find a parametric representation of the sphere, where $0 \leq z \leq 1$
$$x^2 + 2y^2 = z$$

5. Find a parametric representation for the surface
$$z = 2\sqrt{x^2 + y^2}$$
   i.e. The top half of the cone.

6. Find parametric equations for the surface generated by rotating the curve $y = \sin(x)$ about the $x-$axis. Then graph the surface of revolution.

7. Find the tangent plane to the surface with parametric equations $x = u^2$, $y = v^2$, and $z = u+2v$ at the point $(1, 1, 3)$.

8. Find the surface area of a sphere of radius a.

9. Find the area of the part of the paraboloid $z = x^2 + y^2$ that lies under the plane $z = 9$.

10. Find the area of the surface in problem 5 and the tangent plane $(3, 4, 10)$.