NAME: ID#:

SHOW ALL YOUR WORK

1. **(4points)** Find equations of the tangent and normal lines to the graph of the polar curve $r = \sin 2\theta$ at $\theta = \pi/4$.

2. **(4points)** Find the area inside the curve $r = 1 + \cos\theta$ and outside the curve $r = \cos\theta$.

3. **(2points)** The distance from the point $P(x, y, z)$ and the piont $A(1, -2, 0)$ is twice the distance between P and the point $B(0, 1, 1)$. Show that the set of all such points is a sphere and find its center and radius.