

# Calculus III - Quiz 7 - Spring 2015

March 26, 2015

Name: \_\_\_\_\_

For this problem recall that, in spherical coordinates, we have

$$\begin{cases} x = \rho \sin \phi \cos \theta \\ y = \rho \sin \phi \sin \theta \\ z = \rho \cos \phi \end{cases}$$

1. (10 points) Write the spherical coordinates equation:

$$1 = \tan \phi \cos \theta$$

in cartesian coordinates (so, with  $x$ ,  $y$ , and  $z$ 's).

*Hint: Write  $\tan \phi$  in terms of  $\sin \phi$  and  $\cos \phi$  and then multiply both sides by  $\rho$ .*

**Solution:** Replacing  $\tan \phi$  with  $\frac{\sin \phi}{\cos \phi}$  we get

$$1 = \frac{\sin \phi}{\cos \phi} \cos \theta$$

$$\cos \phi = \sin \phi \cos \theta.$$

Now if we multiply by  $\rho$  on both sides:

$$\rho \cos \phi = \rho \sin \phi \cos \theta,$$

which in cartesian coordinates translates to

$$z = x.$$