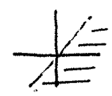
Math 273 Quiz 4B Name: ____________________

5 Feb 2016 Show appropriate work. Point Values in $\boxed{\text{boxes}}$.

1. $\boxed{2}$ Describe the given set in cylindrical coordinates and in spherical coordinates.

$$x^2 + y^2 + z^2 \leq 4, \quad x \geq y, \quad z \geq 0$$

$r^2 + z^2 \leq 4$



Cylindrical

$z \leq \sqrt{4 - r^2}$

$-\frac{3\pi}{4} \leq \theta \leq \frac{\pi}{4}$

Spherical

$\rho \leq 2$

$-\frac{3\pi}{4} \leq \theta \leq \frac{\pi}{4}$

$\phi \leq \frac{\pi}{2}$

2. $\boxed{2}$ Parameterize the intersection of the surfaces $x^2 + z^2 = 4$ and $z = y^3$.

so

$y = \sqrt[3]{z}$

$\langle 2\cos\theta, (2\sin\theta)^{1/3}, 2\sin\theta \rangle$

3. $\boxed{3}$ Find a parameterization of the tangent line to $\mathbf{r}(t) = \langle t^2, \cos \pi t, e^{1-t} \rangle$ at $t = 1$.

$\vec{r}(1) = \langle 1, -1, 1 \rangle$

$\vec{r}\,'(t) = \langle 2t, -\pi \sin \pi t, -e^{1-t} \rangle$

$\vec{r}\,'(1) = \langle 2, 0, -1 \rangle$

$\vec{L}(t) = \langle 1, -1, 1 \rangle + t\langle 2, 0, -1 \rangle$

4. $\boxed{3}$ Find the length of the curve $\mathbf{r}(t) = \langle \cos 3t, 2t^{3/2}, \sin 3t \rangle$ over the interval $0 \leq t \leq 2\pi$.

$\vec{r}\,'(t) = \langle -3\sin 3t, 3t^{1/2}, 3\cos 3t \rangle$

$\|\vec{r}\,'(t)\| = (9\sin^2 3t + 9t + 9\cos^2 3t)^{1/2} = 3\sqrt{1+t}$

$$S = \int_0^{2\pi} 3(1+t)^{1/2}\,dt = 2(1+t)^{3/2}\Big|_0^{2\pi} = 2\left[(1+2\pi)^{3/2} - 1\right]$$