

Test 1 Math 2255 7 February 2006

1. (10 pts) Sketch and/or otherwise describe the object in \mathbb{R}^3 given by $y^2 - 2y - 8x + 20 = 0$. Be sure to indicate intercepts and other interesting points.
2. (10 pts) Sketch and/or otherwise describe the object in \mathbb{R}^3 given in cylindrical coordinates by $r \csc \theta = 3$.
3. (10 pts) Sketch and/or otherwise describe the object in \mathbb{R}^2 given parametrically by $x = 3 + 3 \cos \theta$, $y = 2 + 5 \sin \theta$. **Justify your answer with mathematical details.**
4. (5 pts) Find the coordinates of the point in \mathbb{R}^3 located 2 units in front of the yz -plane, 3 units below the xy -plane, and 6 units to the left of the xz -plane.

5. (5 pts) Find the center and radius of the sphere given by $x^2 + y^2 + z^2 - 2x + 4y - 6z = 0$.
6. (10 pts) Find the distance from the point $(3, -1, 4)$ and the line given by $x = -2 + 3t$, $y = -2t$, and $z = 1 + 4t$. **Do not just invoke a formula: Show your work!**
7. (10 pts) Find an equation for the plane passing through the points $(1, 0, 1)$, $(0, -2, 1)$, $(-1, 1, -1)$.
8. (10 pts) Find parametric, and symmetric equations, for the line that is parallel to the line given by $x = y = z$ and passes through the point $(1, 2, 3)$.

9. (10 pts) Identify and sketch (or otherwise describe) the surface in \mathbb{R}^3 given by $y^2 - z^2 + 2x^2 = 1$.
10. (10 pts) Consider the surface in \mathbb{R}^3 given by $x^2 + y^2 = 4y$.
- (a) Find an equation in cylindrical coordinates to describe the surface.
- (b) Find an equation in spherical coordinates to describe the surface.
11. (10 pts) Sketch or otherwise describe the space curve given by $\mathbf{r}(t) = 2 \cos t \mathbf{i} + 2 \sin t \mathbf{j} + t \mathbf{k}$. Find $\mathbf{r}'(3\pi/2)$ and find $\mathbf{r}''(3\pi/2)$.