

Midterm Exam #2

Math 275

October 15, 2001

Name _____

Do all of your work on the blank paper provided. At the end of the exam, hand in your answers with this cover sheet. Include your name on all pages of your exam.

§1 Calculation

1. Find parametric and symmetric equations of the line through $(3,1,-1)$ and $(8,8,7)$.
2. Find the equation of the plane through $(3,-1,2)$, $(8,2,4)$, and $(-1,-2,-3)$.
3. Find the parametric equations of the line of intersection of the planes $x + y - z = 2$ and $3x - 4y + 5z = 6$. Find the angle between the planes.
4. Identify and sketch each surface. Be sure to indicate your scale.
 - a. $4x^2 + 9y^2 + 36z^2 = 36$.
 - b. $z = 4x^2 + y^2$
 - c. $\frac{x^2}{4} + y^2 - \frac{z^2}{4} = 1$.
5. Find the length of $\mathbf{r}(t) = \langle t^2, \sin t - t \cos t, \cos t + t \sin t \rangle$ from $t = 0$ to $t = \pi$.

§2 Comprehension

6. What are the cylindrical coordinates of the point with Cartesian coordinates (x, y, z) ? What are its spherical coordinates?
7. Let $\mathbf{r}(t) = \langle f(t), g(t), h(t) \rangle$. What is the definition of $\lim_{t \rightarrow a} \mathbf{r}(t)$? What does it mean for $\mathbf{r}(t)$ to be continuous at $t = a$? What does it mean for the curve $\mathbf{r}(t)$ to be smooth on the interval $I = (t_0, t_1)$?

§3 Application

8. Find the distance between the line $x = 1 + t$, $y = 1 + 6t$, $z = 2t$ and the line $x = 1 + 2s$, $y = 5 + 15s$, $z = -2 + 6s$.
9. Let $\mathbf{r}(t) = \langle \cos t, \sin t, t \rangle$. Find \mathbf{T} , \mathbf{N} , and \mathbf{B} .
10. A projectile is fired with an initial speed of 500 m/s and angle of elevation 30° . Find the (approximate) range of the projectile.