Math 252 Exam 1 Practice Test (Problems)

1. Using $\mathbf{u} = \langle -4, 6, 5 \rangle$ and $\mathbf{v} = \langle 2, -3, 1 \rangle$,
   a. Find $\|\mathbf{u}\|$ and $\|\mathbf{v}\|$.
   b. Find $\mathbf{u} \cdot \mathbf{v}$.
   c. Find the angle θ between $\mathbf{u}$ and $\mathbf{v}$.
   d. Find $\text{proj}_{\mathbf{v}}\mathbf{u}$.
   e. Find $\mathbf{u} \times \mathbf{v}$.

2. Using $P(-4, 1, 2)$, $Q(1, -3, 4)$, $R(-1, 0, 2)$,
   a. Find an equation of the plane passing through the points.
   b. Find parametric equations for the line through P and parallel to $a = \langle 2, -1, 4 \rangle$.
   c. Find the distance from the point $(5, -3, 2)$ to the plane.
   d. Find the area of the parallelogram determined by P, Q, and R.

3. Identify the surface $x = y^2$.

4. Identify the surface $4x^2 + 4y^2 + z^2 = 4$.

5. Identify the surface $2x^2 - 3y^2 + 6z^2 = 6$.

6. Identify the surface $x^2 - 6y + 5z^2 = 0$.

7. A baseball is thrown from the stands 128 feet above the field at an angle of 30 degrees up from the horizontal with an initial speed of 64 feet per second.
   a. Give the position vector for any time t.
   b. When will the ball strike the ground?
   c. How far away will the ball strike the ground?
   d. What is the speed of the ball when it strikes the ground?

8. Using $\mathbf{r}(t) = \langle t\cos t, t\sin t, t^2 \rangle$ at $t = 0$,
   a. Find $\mathbf{v}$ and $\mathbf{a}$.
   b. Find $\mathbf{T}$ and $\mathbf{N}$.
   c. Find K.
   d. By first finding $a_{\mathbf{T}}$ and $a_{\mathbf{N}}$,
   express $a = a_{\mathbf{T}}\mathbf{T} + a_{\mathbf{N}}\mathbf{N}$.

Math 252 Exam 1 Practice Test (Answers)

1. a. $\|\mathbf{u}\| = \sqrt{77}$
   $\|\mathbf{v}\| = \sqrt{14}$
   b. $\mathbf{u} \cdot \mathbf{v} = -21$
   c. $\theta = \arccos\left(\frac{-21}{7\sqrt{22}}\right)$

2. a. $2x + 6y + 7z - 12 = 0$
   b. $x = 2t - 4,\ y = -t + 1,\ z = 4t + 2$
   c. $D = \frac{6}{\sqrt{89}}$
   d. $A = \sqrt{89}$

3. Parabolic cylinder

4. ANSWER

5. ANSWER

6. ANSWER

7. ANSWER

8. a. $\mathbf{v} = \langle -t\sin t + \cos t, t\cos t + \sin t, 2t\rangle$
   $\mathbf{a} = \langle -t\cos t - 2\sin t, -t\sin t + 2\cos t, 2\rangle$
   b. $\|\mathbf{v}\| =$
   $\mathbf{T} =$
   $\mathbf{N} =$