

## 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  $\theta$  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.  $\|\mathbf{v}\| =$   
           $\mathbf{T} =$   
           $\mathbf{N} =$