

## Math 252 Cumulative Review (Problems)

1. Given  $\vec{u} = \langle 8, -4, 1 \rangle$  and  $\vec{v} = \langle -4, 4, 2 \rangle$ ,  
find  $\|\vec{u}\|$  and  $\|\vec{v}\|$ .
2. Using  $\mathbf{u} = \langle 8, 3, -5 \rangle$ ,  $\mathbf{v} = \langle 4, -4, -2 \rangle$ ,  
find  $3\mathbf{u} - 4\mathbf{v}$ .
3. Identify via cross-sections the surface defined by the following:

$$y = x^2$$

4. Given  $\vec{u} = \langle 8, -4, 1 \rangle$  and  $\vec{v} = \langle -4, 4, 2 \rangle$ ,  
find  $\vec{u} \cdot \vec{v}$ .
5. Identify via cross-sections the surface defined by the following:

$$x = 3y^2 + 5z^2$$

6. Identify via cross-sections the surface defined by the following:

$$3^2 - y^2 + 3z^2 + 9 = 0$$

7. Given  $\vec{u} = \langle 8, -4, 1 \rangle$  and  $\vec{v} = \langle -4, 4, 2 \rangle$ ,  
find  $\text{proj}_{\vec{v}} \vec{u}$ .
8. Find a vector orthogonal to the plane determined by the points  $P(-2, 0, 3)$ ,  $Q(1, 2, 4)$ , and  $R(-3, 1, 0)$ .
9. Find the set of parametric equations for the line through  $Q(1, 2, 4)$  and parallel to  $a = \langle 4, -3, -2 \rangle$ .
10. Given  $\vec{u} = \langle 8, -4, 1 \rangle$  and  $\vec{v} = \langle -4, 4, 2 \rangle$ ,  
find the angle  $\theta$  between  $\vec{u}$  and  $\vec{v}$ .
11. Find the center and radius of the sphere given by  $x^2 + y^2 + z^2 - 8x + 6y = 0$
12. Find the distance from the point  $(-4, -1, 5)$  to the plane determined by the points  $P(-2, 0, 3)$ ,  $Q(1, 2, 4)$ , and  $R(-3, 1, 0)$ .
13. Find an equation of the plane passing through the points  $P(-2, 0, 3)$ ,  $Q(1, 2, 4)$ , and  $R(-3, 1, 0)$ .
14. Using  $\mathbf{u} = \langle 8, 3, -5 \rangle$ ,  $\mathbf{v} = \langle 4, -4, -2 \rangle$ ,  
find  $\|\mathbf{u}\|$ ,  $\|\mathbf{v}\|$ .
15. Given  $\vec{u} = \langle 8, -4, 1 \rangle$  and  $\vec{v} = \langle -4, 4, 2 \rangle$ ,  
find  $\vec{u} \times \vec{v}$ .
16. Identify via cross-sections the surface defined by the following:

$$2y^2 = 3z^2 = 12$$

## Math 252 Cumulative Review (Answers)

1.  $\|\vec{u}\| = 9, \|\vec{v}\| = 6$
2.  $\langle 8, 25, -7 \rangle$
3. Parabolic cylinder
4.  $\vec{u} \cdot \vec{v} = -46$
5. Elliptical paraboloid
6. Circular hyperboloid of two sheets
7.  $\text{proj}_{\vec{v}} \vec{u} = -\frac{23}{18} \langle -4, 4, 2 \rangle = \langle -\frac{46}{9}, -\frac{46}{9}, -\frac{23}{9} \rangle$
8.  $\vec{n} = \vec{PQ} \times \vec{PR} = \langle -7, 8, 5 \rangle$
9.  $x = 1 + 4t, y = 2 - 3t, z = 4 - 2t; t \in \mathbb{R}$
10.  $\theta = \arccos\left(-\frac{23}{27}\right) = 148.4^\circ$
11.  $C(4, -3, 0), \rho = 5$
12.  $h = \frac{16}{\sqrt{138}}$
13.  $-7x + 8y + 5z = 29$
14.  $\|\mathbf{u}\| = 7\sqrt{2}, \|\mathbf{v}\| = 6$
15.  $\vec{u} \times \vec{v} = \langle -12, -20, 16 \rangle$
16. Elliptical cylinder