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. 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 $R(-3, 1, 0)$.

3. Indentify via cross-sections the surface defined by the following:

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

4. Given $\vec{u} = \langle 8, -4, 1\rangle$ and $\vec{v} = \langle -4, 4, 2\rangle$, font $\vec{u} \times \vec{v}$.

5. Find the center and radius of the sphere given by $x^2 + y^2 + z^2 - 8x + 6x = 0$

6. Using $u = \langle 8, 3, -5\rangle, v = \langle 4, -4, -2\rangle$, find $\|u\|, \|v\|$.

7. Given $\vec{u} = \langle 8, -4, 1\rangle$ and $\vec{v} = \langle -4, 4, 2\rangle$, find $\vec{u} \cdot \vec{v}$.

8. Find the set of parametric equations for the line through $Q(1, 2, 4)$ and parallel to $a = \langle 4, -3, -2\rangle$.

9. Indentify via cross-sections the surface defined by the following:

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

10. Find an equation of the plane passing through the points $P(-2, 0, 3)$, $Q(1, 2, 4)$, and $R(-3, 1, 0)$.

11. Indentify via cross-sections the surface defined by the following:

$$y = x^2$$

12. Indentify via cross-sections the surface defined by the following:

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

13. Find a vector orthogonal to the plane determined by the points $P(-2, 0, 3)$, $Q(1, 2, 4)$, and $R(-3, 1, 0)$.

14. Given $\vec{u} = \langle 8, -4, 1\rangle$ and $\vec{v} = \langle -4, 4, 2\rangle$, find the angle θ between $\vec{u}$ and $\vec{v}$.

15. Using $u = \langle 8, 3, -5\rangle, v = \langle 4, -4, -2\rangle$, find $3u - 4v$.

16. Given $\vec{u} = \langle 8, -4, 1\rangle$ and $\vec{v} = \langle -4, 4, 2\rangle$, find $\text{proj}_{\vec{v}}\vec{u}$.

Math 252 Cumulative Review (Answers)

1. (Math-252 Quiz 2)
   $\|\vec{u}\| = 9, \|\vec{v}\| = 6$

2. (Math-252 Quiz 3)
   $h = \frac{16}{\sqrt{138}}$

3. (Math-252 Quiz 4)
   Circular hyperboloid of two sheets

4. (Math-252 Quiz 2)
   $\vec{u} \times \vec{v} = \langle -12, -20, 16 \rangle$

5. (Math-252 Quiz 1)
   $C(4, -3, 0), \rho = 5$

6. (Math-252 Quiz 1)
   $\|u\| = 7\sqrt{2}, \|v\| = 6$

7. (Math-252 Quiz 2)
   $\vec{u} \cdot \vec{v} = -46$

8. (Math-252 Quiz 3)
   $x = 1 + 4t, y = 2 - 3t, z = 4 - 2t; t \in \mathbb{R}$

9. (Math-252 Quiz 4)
   Elliptical paraboloid

10. (Math-252 Quiz 3)
    $-7x + 8y + 5z = 29$

11. (Math-252 Quiz 4)
    Parabolic cylinder

12. (Math-252 Quiz 4)
    Elliptical cylinder

13. (Math-252 Quiz 3)
    $\vec{n} = \vec{PQ} \times \vec{PR} = \langle -7, 8, 5 \rangle$

14. (Math-252 Quiz 2)
    $\theta = \arccos\left(-\frac{23}{27}\right) = 148.4°$

15. (Math-252 Quiz 1)
    $\langle 8, 25, -7 \rangle$

16. (Math-252 Quiz 2)
    $\text{proj}_{\vec{v}}\vec{u} = -\frac{23}{18}\langle -4, 4, 2 \rangle = \langle -\frac{46}{9}, -\frac{46}{9}, -\frac{23}{9} \rangle$