Student: Phong Vo **Date:** 02/20/18	**Instructor:** Chuck Ormsby **Course:** Multi-Variable and Vector Calculus -- Calculus III Spring 2018	**Assignment:** Section 13.1 Homework

1. To which coordinate axes are the following cylinders in $\mathbf{R}^3$ parallel?

$$z^2 + 5y^2 = 9$$
$$x^2 + 5y^2 = 9$$
$$x^2 + 5z^2 = 9$$

To which coordinate axis is the cylinder, $z^2 + 5y^2 = 9$, in $\mathbf{R}^3$ parallel?

   x-axis

To which coordinate axis is the cylinder, $x^2 + 5y^2 = 9$, in $\mathbf{R}^3$ parallel?

   z-axis

To which coordinate axis is the cylinder, $x^2 + 5z^2 = 9$, in $\mathbf{R}^3$ parallel?

   y-axis

2. Find an equation of the plane that passes through the point $P_0(-3, -2, 2)$ with a normal vector $\mathbf{n} = \langle -1, 1, -2 \rangle$.

   Which of the following equations is an equation of the plane that passes through the point $P_0(-3, -2, 2)$ with a normal vector $\mathbf{n} = \langle -1, 1, -2 \rangle$?

   ○ **A.** An equation for the plane is $x + y + 2z = 6$.
   ○ **B.** An equation for the plane is $x - 2y + 2z = 17$.
   ○ **C.** An equation for the plane is $-3x - 2y + 2z = -3$.
   ✓ **D.** An equation for the plane is $-x + y - 2z = -3$.

3. Find the equation of the plane that is parallel to the vectors $\langle 3,0,3 \rangle$ and $\langle 0,1,2 \rangle$, passing through the point $(1,0,-2)$.

   The equation of the plane is $-3x - 6y + 3z = -9$.
   (Type an equation using x, y, and z as the variables.)

4. Find the equation for the plane through the points $P_0(-3,3,5)$, $Q_0(4,3,-3)$, and $R_0(1,5,-2)$.

   The equation of the plane is $16x + 17y + 14z = 73$.

5. Determine if the following pair of planes is parallel, orthogonal, or neither parallel nor orthogonal.

   $$x + y + 4z = 18 \text{ and } -x - 3y + z = 18$$

   Choose the correct answer below.

   ○ **A.** The planes are neither parallel nor orthogonal.
   ✓ **B.** The planes are orthogonal.
   ○ **C.** The planes are parallel.

6. Determine if the following pair of planes is parallel, orthogonal, or neither parallel nor orthogonal.

$3x + 2y - 3z = 22$ and $-6x - 10y + z = 22$

Choose the correct answer below.

  ○ **A.** The planes are orthogonal.
  ○ **B.** The planes are parallel.
  ✔ **C.** The planes are neither parallel nor orthogonal.

7. Find an equation of the plane parallel to the plane Q passing through the point P_0.

$Q: 2x + 3y + 4z = 1; \ P_0(-2,0,-3)$

Which of the following equations is an equation of the plane parallel to the plane Q passing through the point P_0?

  ○ **A.** An equation for the plane is $-2x - 3z = 13$.
  ✔ **B.** An equation for the plane is $2x + 3y + 4z = -16$.
  ○ **C.** An equation for the plane is $-3x + 2y - z = 1$.
  ○ **D.** An equation for the plane is $2x + 4y + 3z = -29$.

8. Find an equation of the line where the planes Q and R intersect.

$Q: -x + 3y - 2z = 1; \ R: x + y + z = 1$

Choose the correct answer below.

  ○ **A.** An equation of the line is given by $x = -4t, \ y = \dfrac{1}{2} + 5t, \ z = \dfrac{1}{2} - t$, where $-\infty < t < \infty$.

  ○ **B.** An equation of the line is given by $x = 2 + 3t, \ y = -t, \ z = 2 - 2t$, where $-\infty < t < \infty$.

  ○ **C.** An equation of the line is given by $x = 2 + 5t, \ y = 2 + 3t, \ z = -t$, where $-\infty < t < \infty$.

  ✔ **D.** An equation of the line is given by $x = \dfrac{1}{2} + 5t, \ y = \dfrac{1}{2} - t, \ z = -4t$, where $-\infty < t < \infty$.

9. Find an equation of the line where the planes Q and R intersect.

$Q: x - y + 2z = 1; \ R: x + y + z = 0$

Choose the correct answer below.

  ○ **A.** An equation of the line is given by $x = 2t, \ y = -\dfrac{1}{2} - 3t, \ z = \dfrac{1}{2} + t$, where $-\infty < t < \infty$.

  ○ **B.** An equation of the line is given by $x = -2 - t, \ y = t, \ z = 2 + 2t$, where $-\infty < t < \infty$.

  ✔ **C.** An equation of the line is given by $x = \dfrac{1}{2} - 3t, \ y = -\dfrac{1}{2} + t, \ z = 2t$, where $-\infty < t < \infty$.

  ○ **D.** An equation of the line is given by $x = 2 - 3t, \ y = -2 - t, \ z = t$, where $-\infty < t < \infty$.

10. Find an equation of the line where the planes Q and R intersect.

    Q: $2x - 3y + 4z = 1$; R: $x + y + z = 0$

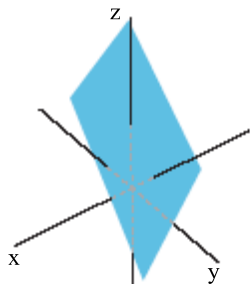
    Choose the correct answer below.

    ○ **A.** An equation of the line is given by $x = 5t$, $y = -\dfrac{1}{5} - 7t$, $z = \dfrac{1}{5} + 2t$, where
    $-\infty < t < \infty$.

    ✔ **B.** An equation of the line is given by $x = \dfrac{1}{5} - 7t$, $y = -\dfrac{1}{5} + 2t$, $z = 5t$, where
    $-\infty < t < \infty$.

    ○ **C.** An equation of the line is given by $x = -5 - 3t$, $y = 2t$, $z = 5 + 4t$, where $-\infty < t < \infty$.

    ○ **D.** An equation of the line is given by $x = 5 - 7t$, $y = -5 - 3t$, $z = 2t$, where $-\infty < t < \infty$.
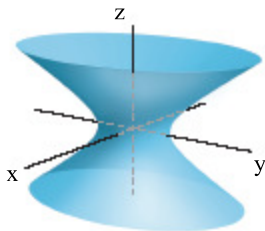
11. Match the given equation with its graph.

    $$9x^2 + \frac{y^2}{16} + z^2 = 1$$

    Choose the correct graph below.

    ✗ **A.**

    B.

    ★ **C.**
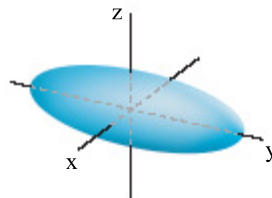
    YOU ANSWERED: A.

12. Identify the surface defined by the following equation.

    $$x = \frac{y^2}{15} - \frac{z^2}{16}$$

    The surface defined by the equation is a hyperbolic paraboloid.

13. Identify the surface defined by the following equation.

    $$16z^2 + y^2 = 1$$

    The surface defined by the equation is a cylinder.