1. Multiple choice. Clearly mark your answers. No justification is required but may result in partial credit if provided.

   (a) [3 pts] For any two vectors $\mathbf{u}$ and $\mathbf{v}$ in $\mathbb{R}^3$, the equation $\mathbf{u} \times (\mathbf{v} \times \mathbf{u}) = \mathbf{0}$ always holds.

   (a) True.
   (b) False.
   (c) Indeterminable.

   (b) [3 pts] The two planes $y + 2z - x = 7$ and $-y - 2z + x = 0$ intersect in a line.

   (a) True.
   (b) False.
   (c) Indeterminable.

   (c) [3 pts] The lines $\mathbf{r}_1(t) = \langle 5+t, 3-t, 2-t \rangle$ and $\mathbf{r}_2(t) = \langle 6-t, 2+t, 1-2t \rangle$ intersect at $(6, 2, 1)$ perpendicularly.

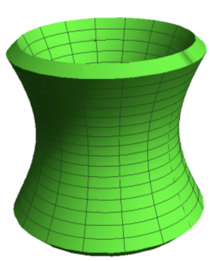
   (a) True.
   (b) False.
   (c) Indeterminable.

2. [3 pts] Provide a parametrization of the line $L$ passing through the point $(-2, 2, 4)$ and perpendicular to the plane $2x - y + 5z = 12$.

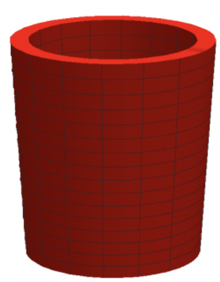
3. [4 pts] Find an equation of the plane that passes through the point $A(1, 5, 1)$ and is orthogonal to the plane $6x + y - 6z = 6$.

4. [4 pts] Match the contour surfaces with their equations. Enter $O$ if there's no match.

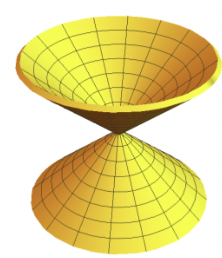
I



II



III



| $g(x, y, z) =$ | $O$, (I), (II), (III) |
|---|---|
| $x^2 + y^2 - z^2 = 1$ | |
| $x^2 + y^2 + z^2 = 1$ | |
| $x^2 + y^2 = 1$ | |
| $x^2 + y^2 = z^2$ | |