

Instructions: Show all work. Use exact answers unless specifically asked to round. Be sure to complete all parts of each question.

1. Find the equation of the plane that contains the line $\frac{x-3}{4} = \frac{y+2}{2} = z$ and the point, $(2,2,7)$. [Hint: find a point on the line and the vector between that point and the given point to obtain a second vector in the plane.]

in plane $\langle 4, 2, 1 \rangle = v_1$ $v_2 = (2-3, 2-(-2), 7-0) = \langle -1, 4, 7 \rangle$
 point in plane / line $(3, -2, 0)$ $\xrightarrow{t=0}$

$$\vec{n} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 4 & 2 & 1 \\ -1 & 4 & 7 \end{vmatrix} = (14-4)\hat{i} - (28+1)\hat{j} + (16+2)\hat{k} = 10\hat{i} - 29\hat{j} + 18\hat{k} = \langle 10, -29, 18 \rangle$$

$$10(x-2) - 29(y-2) + 18(z-7) = 0$$

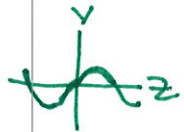
2. Describe or sketch the graphs of the surfaces given by the equations below.

a. $x^2 + y^2 = z^2$

Cone, wrapped around z-axis



b. $y = \sin z$



Sine wave going up z-axis, extending forever in x (sheet)

c. $x^2 + y^2 + z^2 + 6x - 4y + 8z - 35 = 0$ $(x+3)^2 + (y-2)^2 + (z+4)^2 = 64$

Sphere of radius $r=8$ centered at $(-3, 2, -4)$