3.5.

6. Parametric eqns: $x = t$
$y = 2t$
$z = 3t$

Symmetric eqns $x = \frac{y}{2} = \frac{z}{3}$

12. parametric eqns $x = t$, $y = 1$, $z = -t$
symmetric eqns $x = -z$, $y = 1$

16. a) parametric eqns: $x = 5 + 2t$, $y = 1 - t$, $z = t$

b) xy plane: $(5, 1, 0)$
yz ": $(0, \frac{7}{2}, -\frac{5}{2})$
xz ": $(7, 0, 1)$

32. Normal vector to the plane: $\vec{n} = \vec{a} \times \vec{b} = \langle -18, 24, 22 \rangle$
An equation: $-18x + 24y + 22z = 0$

38. Setting $z = 0$, $(1, 3, 0)$ is a point on the line of intersection
Direction vector: $\vec{v}_1 = \vec{n}_1 \times \vec{n}_2 = \langle 1, -2, 1 \rangle$
A second vector parallel to the desired plane: $\vec{v}_2 = \langle 1, 1, -2 \rangle$
$\Rightarrow$ Normal vector: $\vec{n} = \vec{v}_1 \times \vec{v}_2 = \langle 3, 3, 3 \rangle$
$\Rightarrow$ The equation: $x + y + z = 4$

48. The normal vectors $\vec{n}_1 = \langle 2, -3, 4 \rangle$, $\vec{n}_2 = \langle 1, 6, 4 \rangle$ are not parallel.
So the planes aren't parallel.
$\vec{n}_1 \cdot \vec{n}_2 = 0 \Rightarrow$ The normals (and thus the planes) are perpendicular

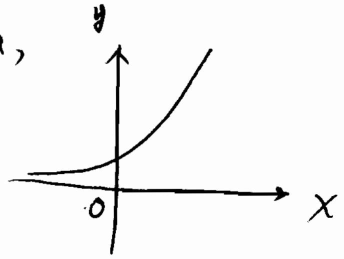
58. (a) Set $\begin{cases} 1 + t = 2 - s \\ 1 - t = s \\ 2t = 2 \end{cases}$ $\Rightarrow t = 1$, $s = 0$

The lines intersect at the point $P_0\ (2, 0, 2)$

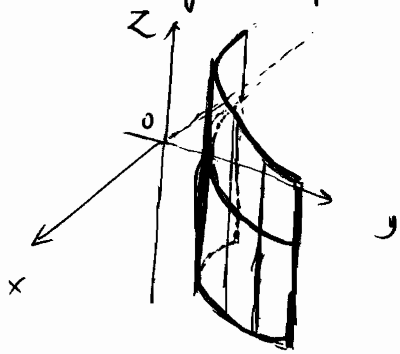
(b) Normal vector: $\langle -1, 1, 0 \rangle \times \langle 1, -1, 2 \rangle = \langle 2, 2, 0 \rangle$
The equation: $x + y = 2$

66. Distance $D = \frac{26}{\sqrt{53}}$

13.6. 2. (a)



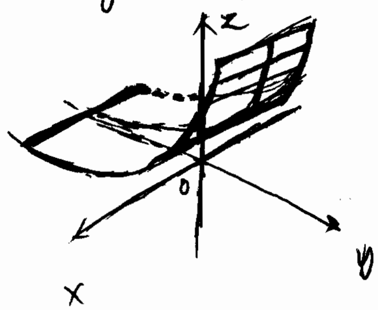
(b) Since the equation $y = e^x$ doesn't involve z, horizontal traces are copies of the curve $y = e^x$. The rulings are parallel to the z-axis.



) $z = e^y$ doesn't involve x

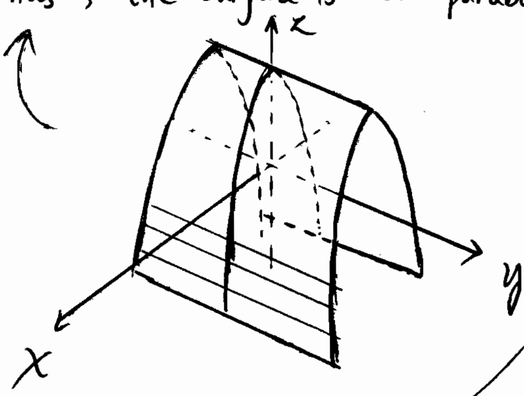
So vertical traces in $x = k$ are copies of the curve $z = e^y$

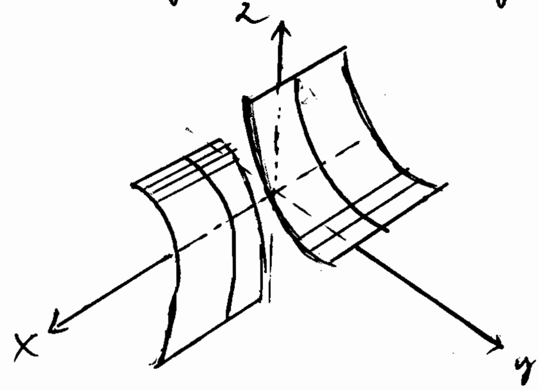
The rulings are parallel to the x-axis



4. Since y is missing from the equation, each vertical trace $\begin{cases} z = 4 - x^2 \\ y = k \end{cases}$ is a copy of the same parabola in the plane $y = k$.

Thus, the surface is a parabolic cylinder with rulings parallel to the y-axis.





6. Since x is missing, each vertical trace $\begin{cases} yz = 4 \\ x = k \end{cases}$ is a copy of the same hyperbola in the plane $x = k$.

Thus, the surface $yz = 4$ is a hyperbolic cylinder with rulings parallel to the x-axis.

13.7. 10. $(3\sqrt{2}, \frac{\pi}{4}, -2)$.

18. $(\frac{\sqrt{6}}{2}, \frac{\sqrt{6}}{2}, 1)$

22. $(2\sqrt{2}, \frac{3\pi}{4}, \frac{\pi}{6})$

40. Since $\rho \sin\phi = 2 \Rightarrow \begin{cases} x = \rho\sin\phi\cos\theta = 2\cos\theta \\ y = \rho\sin\phi\sin\theta = 2\sin\theta \end{cases}$

$\Rightarrow x^2+y^2=4$, i.e., a circular cylinder of radius 2 about the z-axis.

42. $\rho = 2\cos\phi \Rightarrow \rho^2 = 2\rho\cos\phi \Rightarrow x^2+y^2+z^2=2z \Leftrightarrow x^2+y^2+(z-1)^2=0$.

i.e. the surface is a sphere of radius 1 centered at $(0,0,1)$.