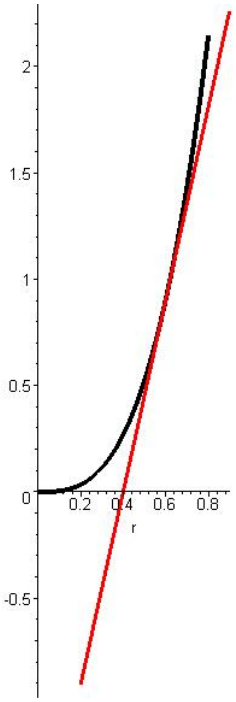
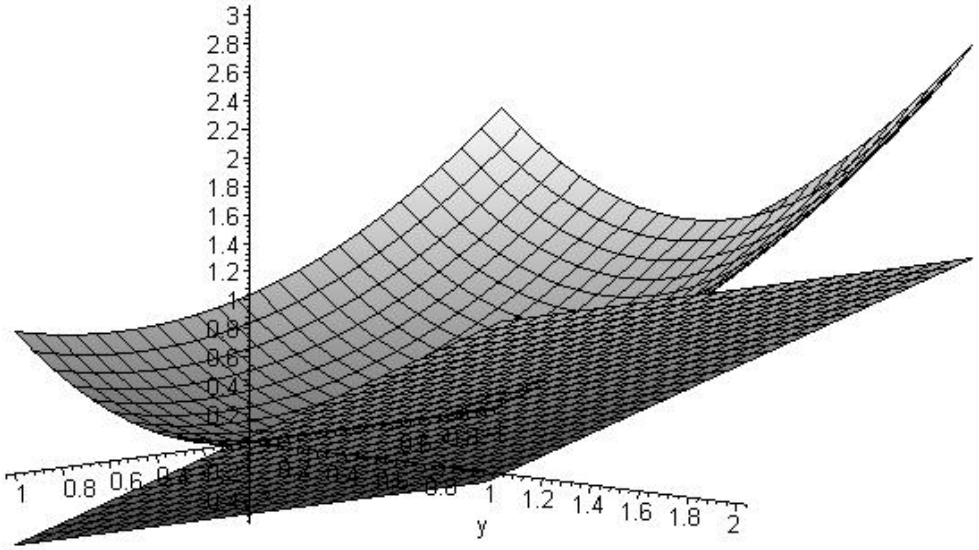
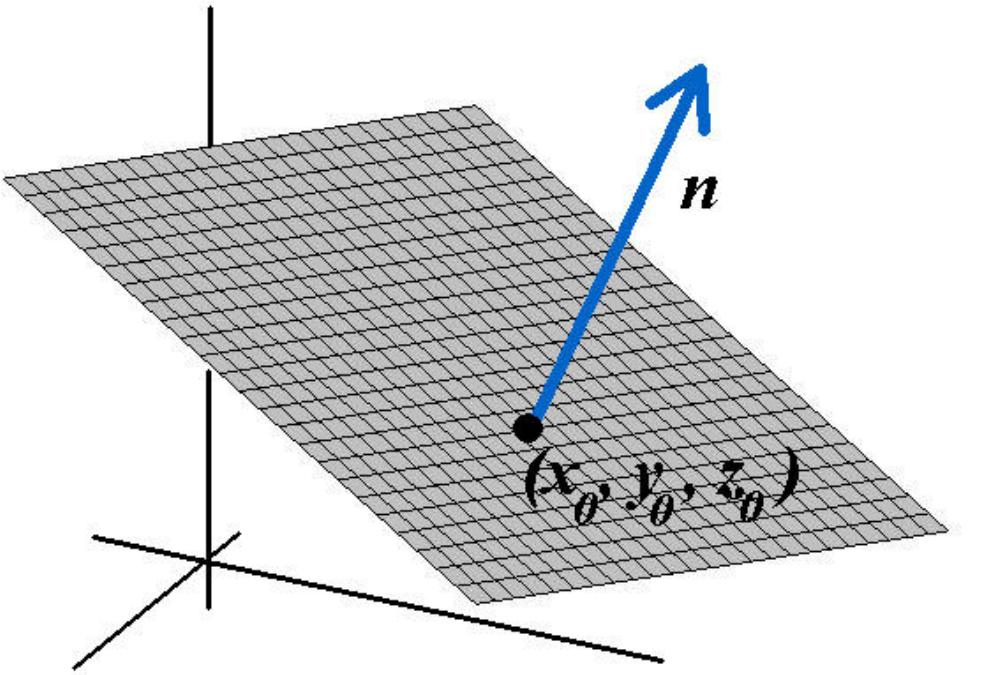
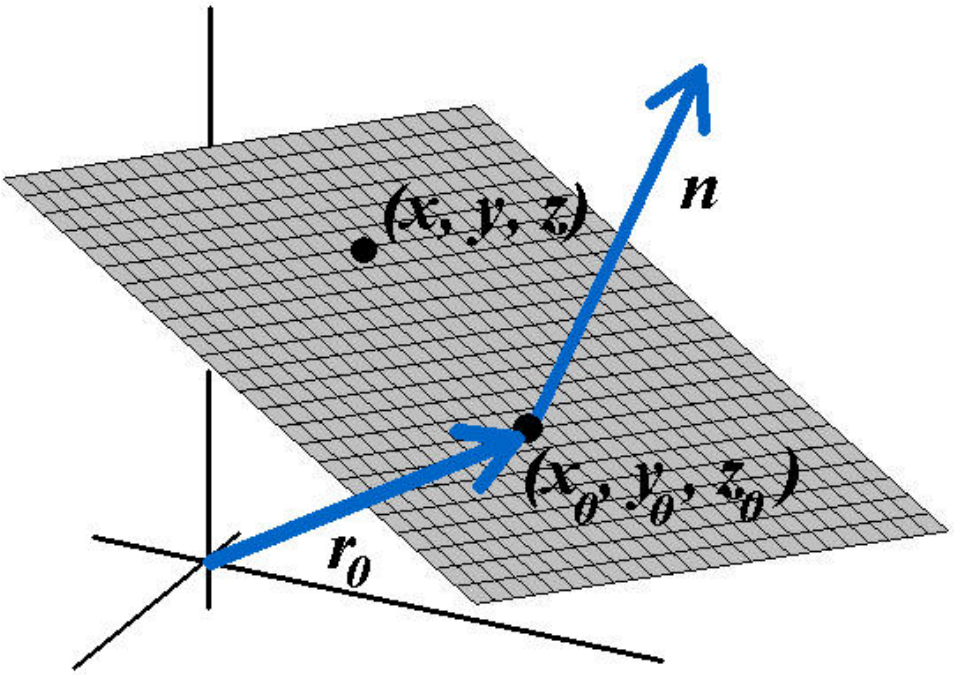
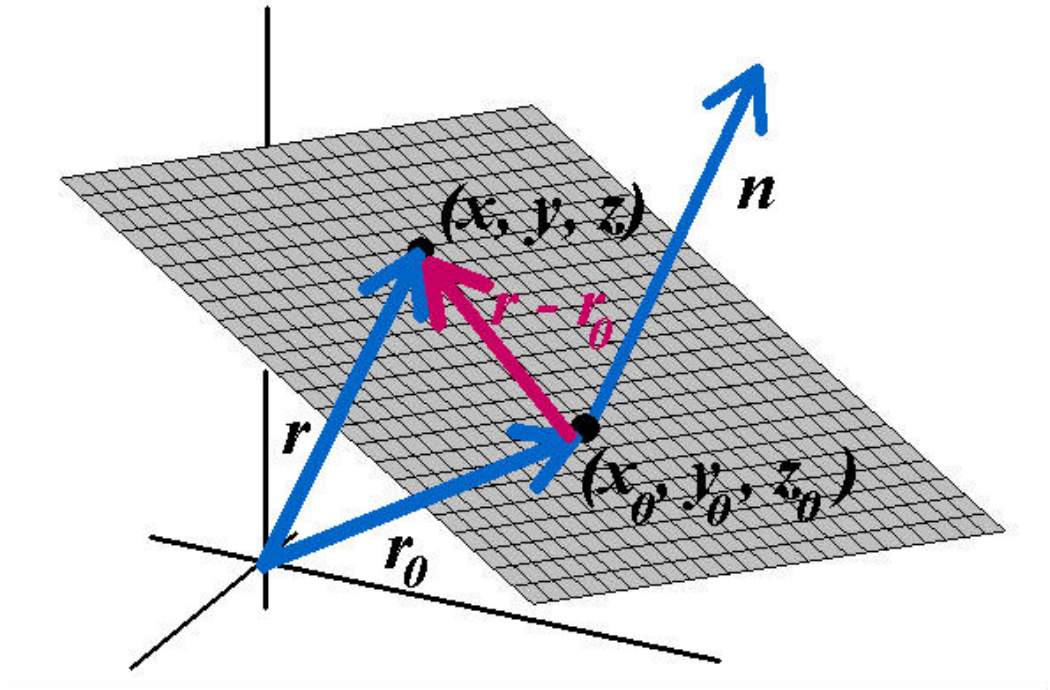
Tangent line




3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
1
0.8
0.6
1
1.2
1.4
1.6
1.8
2
y


n
(x_0, y_0, z_0)


(x, y, z)
n
(x0, y0, z0)
r0



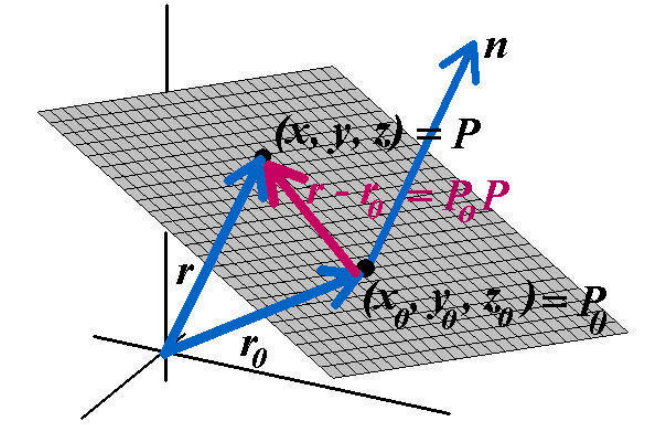
$$\vec{\mathbf{n}} \bullet (\vec{\mathbf{r}} - \vec{\mathbf{r}}_0) = 0$$

Notation Used in Thomas' Calculus

Let P be the point on the plane that vector $\vec{\mathbf{r}}$ points to
Let P_0 be the point on the plane that vector $\vec{\mathbf{r}}_0$ points to
P_0P is the vector connecting these two points

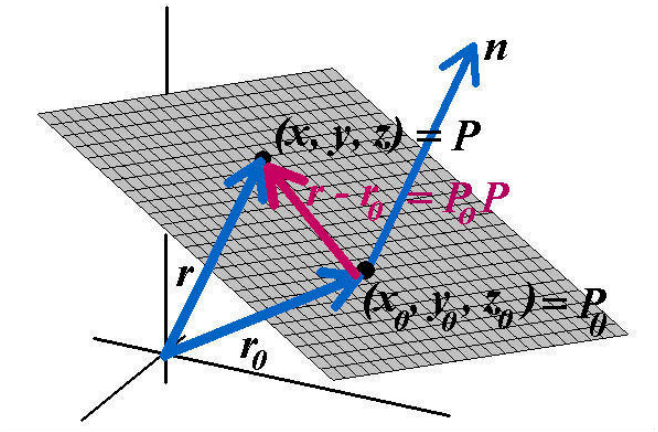
$$P_0P = \vec{\mathbf{r}} - \vec{\mathbf{r}}_0$$

$$\vec{\mathbf{n}} \bullet (\vec{\mathbf{r}} - \vec{\mathbf{r}}_0) = 0 \qquad \vec{\mathbf{n}} \bullet P_0P = 0$$



$$\vec{\mathbf{n}} \bullet (\vec{\mathbf{r}} - \vec{\mathbf{r}}_0) = 0$$

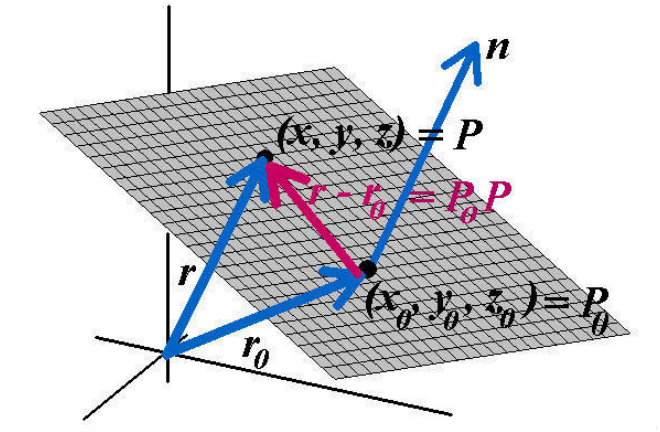
$$\langle a,\ b,\ c\rangle \bullet \langle x - x_0,\ y - y_0,\ z - z_0\rangle = 0$$



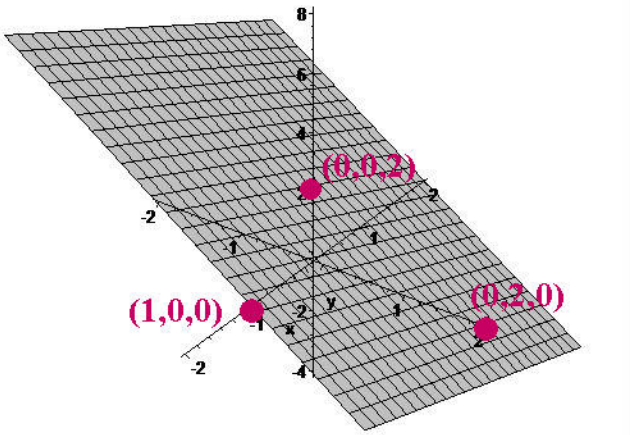
$$\vec{\mathbf{n}} \bullet (\vec{\mathbf{r}} - \vec{\mathbf{r}}_0) = 0$$

$$\langle a,\ b,\ c \rangle \bullet \langle x - x_0,\ y - y_0,\ z - z_0 \rangle = 0$$

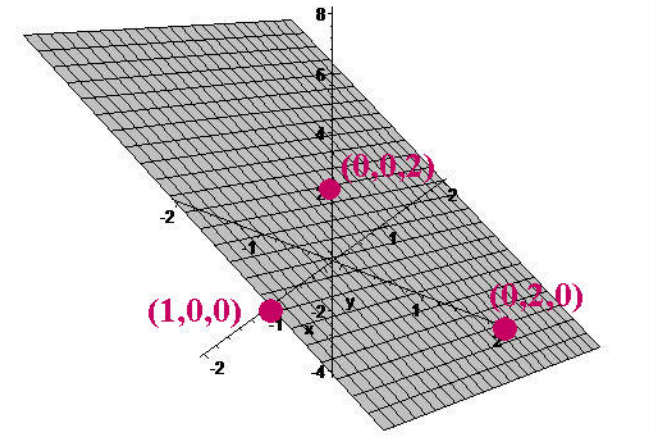
$$a(x - x_0) + b(y - y_0) + c(z - z_0) = 0$$



Find the equation of the plane that passes through the points $(1,\ 0,\ 0)$, $(0,\ 2,\ 0)$ and $(0,\ 0,\ 2)$



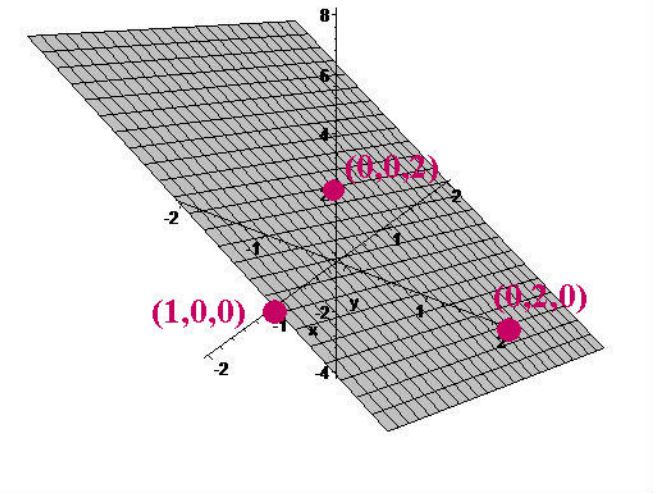
$$\vec{\mathbf{n}} \bullet (\vec{\mathbf{r}} - \vec{\mathbf{r}}_0) = 0$$



$$\vec{\mathbf{n}} \bullet (\vec{\mathbf{r}} - \vec{\mathbf{r}}_0) = 0$$

$$\vec{\mathbf{n}} \bullet (\langle x, y, z \rangle - \langle 1, 0, 0 \rangle) = 0$$

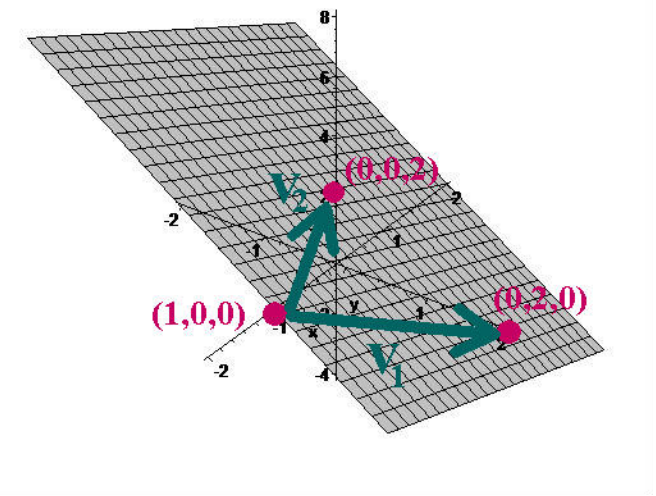
$$\vec{\mathbf{n}} \bullet \langle x - 1,\ y,\ z \rangle = 0$$



$$\vec{\mathbf{n}} \bullet (\vec{\mathbf{r}} - \vec{\mathbf{r}}_0) = 0$$

$$\vec{\mathbf{n}} \bullet (\langle x, y, z \rangle - \langle 1, 0, 0 \rangle) = 0$$

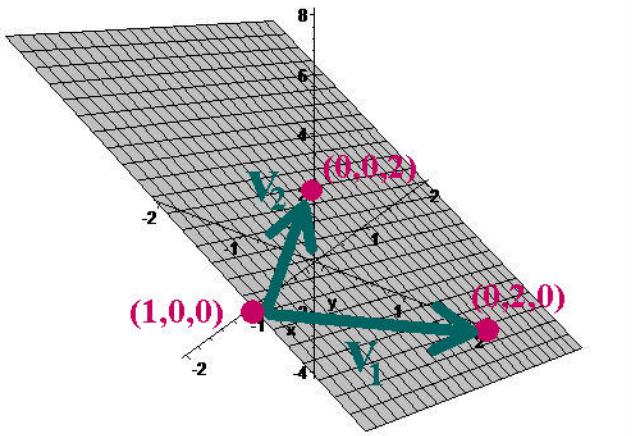
$$\vec{\mathbf{n}} \bullet \langle x - 1,\ y,\ z \rangle = 0$$



$$\vec{\mathbf{v}}_1 = \langle 0, 2, 0 \rangle - \langle 1, 0, 0 \rangle = \langle -1, 2, 0 \rangle$$

$$\vec{\mathbf{v}}_2 = \langle 0, 0, 2 \rangle - \langle 1, 0, 0 \rangle = \langle -1, 0, 2 \rangle$$

$$\vec{\mathbf{v}}_1 \times \vec{\mathbf{v}}_2 = \begin{vmatrix} \vec{\mathbf{i}} & \vec{\mathbf{j}} & \vec{\mathbf{k}} \\ -1 & 2 & 0 \\ -1 & 0 & 2 \end{vmatrix} = \langle 4, 2, 2 \rangle = 2\langle 2, 1, 1 \rangle$$



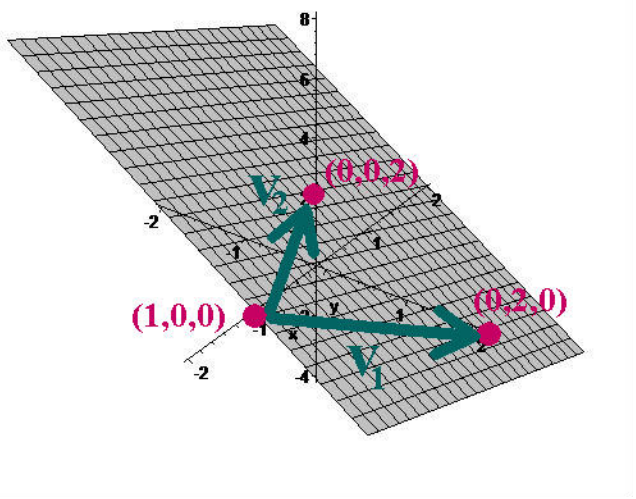
$$\vec{\mathbf{n}} \bullet (\vec{\mathbf{r}} - \vec{\mathbf{r}}_0) = 0$$

$$\vec{\mathbf{n}} \bullet (\langle x, y, z \rangle - \langle 1, 0, 0 \rangle) = 0$$

$$\vec{\mathbf{n}} \bullet \langle x - 1,\ y,\ z \rangle = 0$$

$$\vec{\mathbf{v}}_1 \times \vec{\mathbf{v}}_2 = 2\langle 2, 1, 1 \rangle$$

$$\langle 2,\ 1,\ 1 \rangle \bullet \langle x - 1,\ y,\ z \rangle = 0$$

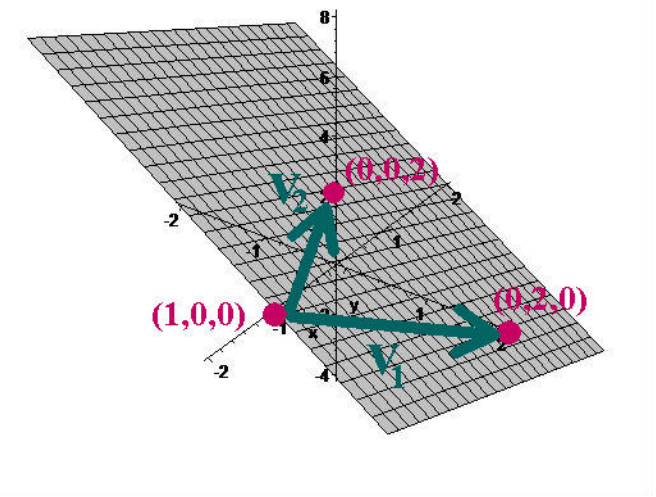


$$\vec{\mathbf{n}} \bullet (\vec{\mathbf{r}} - \vec{\mathbf{r}}_0) = 0$$

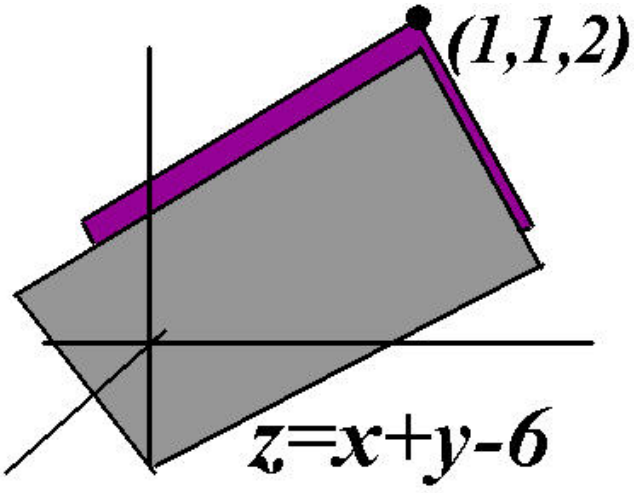
$$\langle 2,\ 1,\ 1\rangle \bullet \langle x-1,\ y,\ z\rangle = 0$$

$$2(x-1) + 1y + 1z = 0$$

$$2x + y + z = 2$$



Find the equation of the plane that passes through (1, 1, 2) and is parallel to the plane $z = x + y - 6$

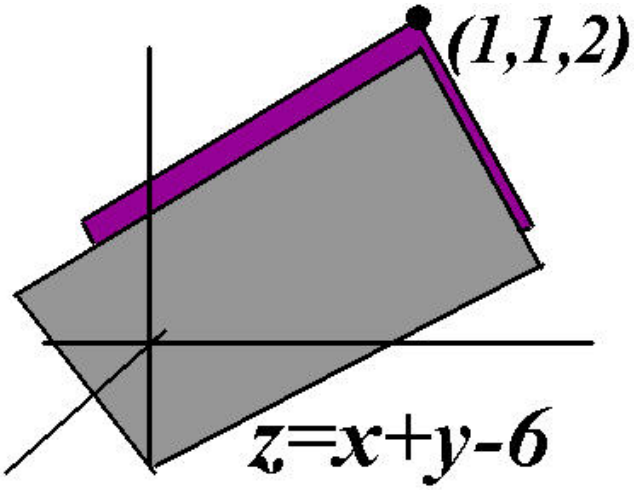


Find the equation of the plane that passes through $(1,\ 1,\ 2)$ and is parallel to the plane $z = x + y - 6$

$$\vec{\mathbf{n}} \bullet (\vec{\mathbf{r}} - \vec{\mathbf{r}}_0) = 0$$

$$\vec{\mathbf{n}} \bullet (\langle x, y, z\rangle - \langle 1, 1, 2\rangle) = 0$$

$$\vec{\mathbf{n}} \bullet \langle x - 1,\ y - 1,\ z - 2\rangle = 0$$

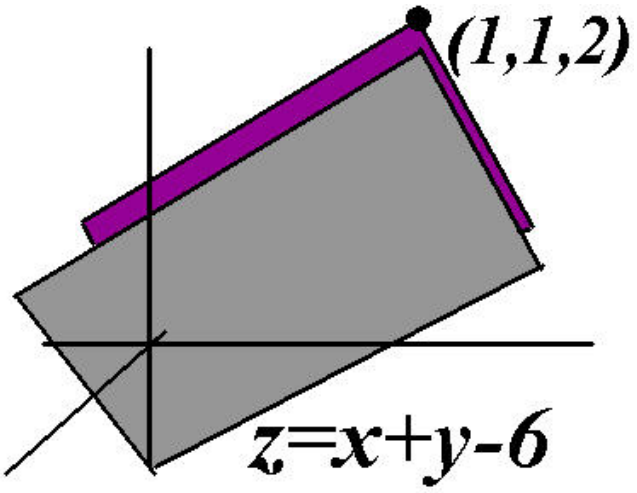


Find the equation of the plane that passes through $(1,\ 1,\ 2)$ and is parallel to the plane $z = x + y - 6$
Equivalently, $1x + 1y + (-1)z = 6$. This is now in the form $ax + by + cz = d$ so $\vec{\mathbf{n}} = \langle 1,\ 1,\ -1 \rangle$

$$\vec{\mathbf{n}} \bullet (\vec{\mathbf{r}} - \vec{\mathbf{r}}_0) = 0$$

$$\vec{\mathbf{n}} \bullet (\langle x, y, z \rangle - \langle 1, 1, 2 \rangle) = 0$$

$$\langle 1,\ 1,\ -1 \rangle \bullet \langle x - 1,\ y - 1,\ z - 2 \rangle = 0$$



$$\vec{\mathbf{n}} \bullet (\vec{\mathbf{r}} - \vec{\mathbf{r}}_0) = 0$$

$$\langle 1,\ 1,\ -1 \rangle \bullet \langle x-1,\ y-1,\ z-2 \rangle = 0$$

$$1(x-1) + 1(y-1) - 1(z-2) = 0$$

$$x + y - z = 0$$

$$z = x + y$$