Step-1

Now let A be the 3 by 3 identity matrix and let $b=(1,0,0)$. We need to obtain the multiple of $V=(1,1,1)$, so that $P(y)=\frac{1}{2}y^{\mathrm{T}}y-y_1$ will be minimum?

Step-2

Let the required $y=(y_1,y_2,y_3)^{\mathrm{T}}$.

Therefore, we get

$$\begin{aligned}P(y)&=\frac{1}{2}y^{\mathrm{T}}y-y_1\\&=\frac{1}{2}(y_1,y_2,y_3)\begin{bmatrix}y_1\\y_2\\y_3\end{bmatrix}-y_1\\&=\frac{1}{2}\left(y_1^2+y_2^2+y_3^2\right)-y_1\\&=\frac{y_1^2+y_2^2+y_3^2-2y_1}{2}\end{aligned}$$

Step-3

Whatever be $y=(y_1,y_2,y_3)^{\mathrm{T}}$, the quantities y_2^2 and y_3^2 will be non negative. Therefore, their minimum will be zero.

Thus, $y=(y_1,0,0)^{\mathrm{T}}$.

This gives, $P(y)=\frac{y_1^2-2y_1}{2}$

Step-4

Let us consider a function *f*, such that $f(x)=x^2-2x$. Differentiating *f* with respect to *x*, gives $f'(x)=2x-2$.

Equating $f'(x)$ to zero gives $x=1$.

Therefore, the minimum of *f* occurs when $x=1$. Similarly, $P(y)=\frac{y_1^2-2y_1}{2}$ is minimum when $y_1=1$.

Step-5

Therefore, the required $\boxed{y=(1,0,0)^{T}}$.