Step-1

A 3 dimensional space is understood by 3 axes *x*, *y*, and *z*. Each axis can be divided into two types â€“ positive and negative.

Consider the two vectors $(1,0,0)$ and $(-1,0,0)$, which are along the *x*-axis. Any vector along the *x*-axis can be expressed as $\alpha(1,0,0)$ or $\alpha(-1,0,0)$, where Î± is a nonnegative number.

Step-2

Similarly, any vector along the *y*-axis can be expressed as $\beta(0,1,0)$ or $\beta(0,-1,0)$, where Î² is a non negative number.

Finally, any vector along the *z*-axis can be expressed as $\gamma(0,0,1)$ or $\gamma(0,0,-1)$, where Î³ is a non negative number.

Step-3

Thus, any vector in the 3 dimensional space can be expressed as a nonnegative combination of the following six vectors: $(1,0,0)$, $(-1,0,0)$, $(0,1,0)$, $(0,-1,0)$, $(0,0,1)$, and $(0,0,-1)$.

Thus, a required set of six vectors is as follows: $\boxed{\{(\pm1,0,0),(0,\pm1,0),(0,0,\pm1)\}}$

It may be noted that this set is not unique. If *a* is any positive number, then the following set of six vectors will certainly serve the purpose: $\{(\pm a,0,0),(0,\pm a,0),(0,0,\pm a)\}$.

Step-4

Now a nonzero component of a vector is either positive or negative. If *p* is a positive number, then we can write $p = p\times1$ and if *p* is negative, (that is â€“*p* is positive), we can write $p = -p\times(-1)$.

This gives us the idea that any vector in the 3 dimensional space can be expressed as a nonnegative combination of the following vectors: $(1,0,0)$, $(0,1,0)$, $(0,0,1)$, and $(-1,-1,-1)$.

Thus, a required set of four vectors is as follows: $\boxed{\{(1,0,0),(0,1,0),(0,0,1),(-1,-1,-1)\}}$. As before, this set is not unique. The set $\{(a,0,0),(0,a,0),(0,0,a),(-a,-a,-a)\}$ also serves the required purpose.