

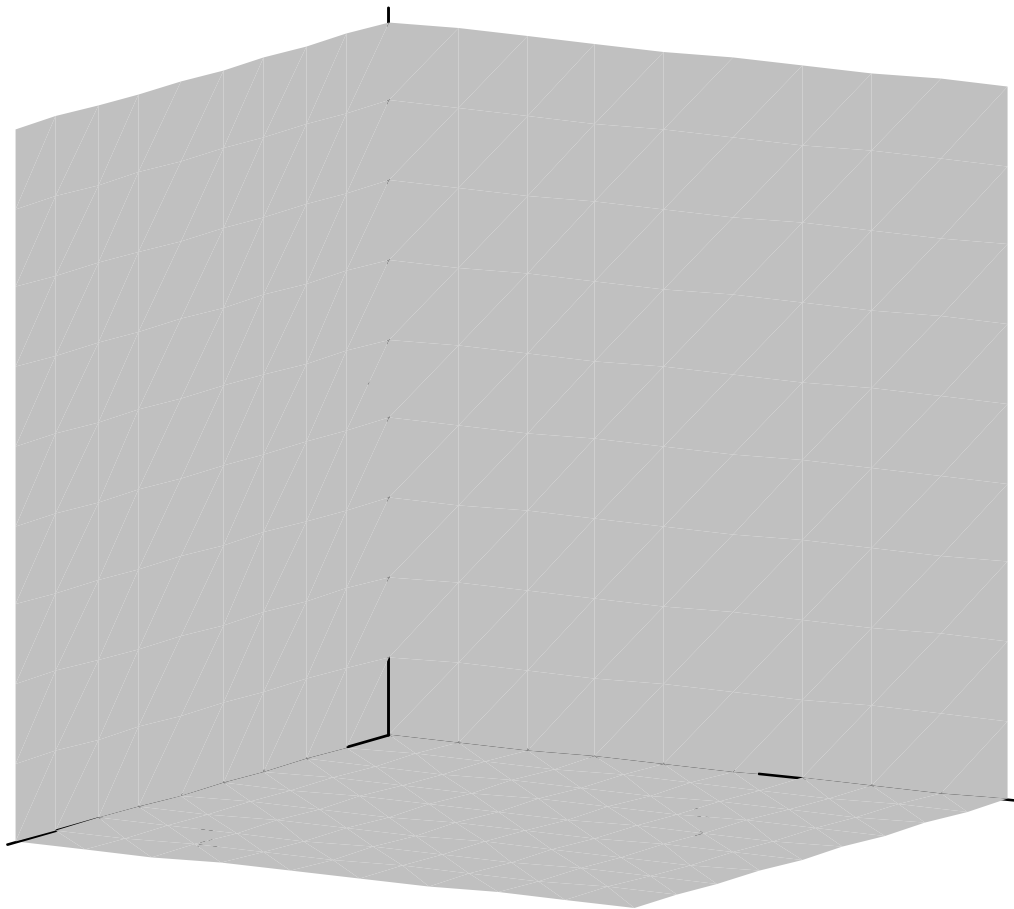
```

> restart :
> interface(warnlevel=0) :      # `Maple 12
> with(plots) :
> with(LinearAlgebra) :

> f1 := y=0 :    # equation of an infinite x-z plane in 3D space
f2 := x=0 :    # equation of an infinite y-z plane in 3D space
f3 := z=0 :    # equation of an infinite x-y plane in 3D space

> p1 := implicitplot3d(f1, x=0..2, y=0..2, z=0..2, axes=normal,
                      style=patchnogrid, color=grey) :
p2 := implicitplot3d(f2, x=0..2, y=0..2, z=0..2, axes=normal,
                      style=patchnogrid, color=grey) :
p3 := implicitplot3d(f3, x=0..2, y=0..2, z=0..2, axes=normal,
                      style=patchnogrid, color=grey) :
display([p1, p2, p3], axes=normal, tickmarks=[0, 0, 0], scaling=constrained,
        orientation=[31, 80]);

```



First quadrant bound by $x=2$, $y=2$ and $z=2$

```
> C := Vector([2, 0, 1]); # vector C
```

$$C := \begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix} \quad (1)$$

```
> A := θ → Matrix([ [cos(θ), -sin(θ), 0], [sin(θ), cos(θ), 0], [0, 0, 1] ]); # matrix A
```

$$A := \theta \rightarrow \text{Matrix}([[\cos(\theta), -\sin(\theta), 0], [\sin(\theta), \cos(\theta), 0], [0, 0, 1]]) \quad (2)$$

The DrawV procedure carries out the matrix vector multiplication AC starting at $\theta=0$ and ending at $\theta=\pi/2$ using $\pi/16$ increments. When $\theta=0$ then $A=I_3$ and $AC=C$. When $\theta=\pi/2$ then $AC=D$ where D is given by

```
> ' A(π/2) · C' = Multiply(A(π/2), C);
```

$$A\left(\frac{1}{2} \pi\right) C = \begin{bmatrix} 0 \\ 2 \\ 1 \end{bmatrix} \quad (3)$$

```
> DrawV := proc( )
    local i, r, O, S, F, Z, Vz, θ;
    Z := [ ];
    r := evalf(1/16); # θ = 0 → π/2, using r increments

    for i from 0 by r to 0.5 do # 90 degrees rotation
        θ := π · i;
        Vz := simplify(Multiply(A(θ), C)); # incremental vectors
        Z := [op(Z), Vz]; # list of vectors
    end do;
    S := arrow(Z[2..(nops(Z)-1)], color = yellow); # step vectors
    O := arrow(Z[1], color = green); # initial vector, vector C
    F := arrow(Z[-1], color = red); # last vector in the list, vector D
    print(The list of vectors); print(Z);
    display([p1, p2, O, S, F], axes = normal, tickmarks = [3, 3, 3], scaling = constrained,
            orientation = [31, 80]);
end proc;
```

> DrawV();

The list of vectors

$\begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 1.961570561 \\ 0.3901806442 \\ 1 \end{bmatrix}, \begin{bmatrix} 1.847759065 \\ 0.7653668650 \\ 1 \end{bmatrix}, \begin{bmatrix} 1.662939225 \\ 1.111140466 \\ 1 \end{bmatrix}, \begin{bmatrix} 1.414213562 \\ 1.414213563 \\ 1 \end{bmatrix}, \begin{bmatrix} 1.111140466 \\ 1.662939225 \\ 1 \end{bmatrix},$
 $\begin{bmatrix} 0.7653668650 \\ 1.847759065 \\ 1 \end{bmatrix}, \begin{bmatrix} 0.3901806440 \\ 1.961570561 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 2 \\ 1 \end{bmatrix}$

