Rodrigues Formula

$$R(\hat{n},\theta) = I + \sin\theta\,[\hat{n}]_\times + (1-\cos\theta)\,[\hat{n}]_\times^2$$

$$[\hat{n}]_\times = \begin{vmatrix} 0 & -\hat{n}_z & \hat{n}_y \\ \hat{n}_z & 0 & -\hat{n}_x \\ -\hat{n}_y & \hat{n}_x & 0 \end{vmatrix}$$

: Rotation by 90° using cross product.

- Normalized unit vector $\hat{n} = (\hat{n}_x, \hat{n}_y, \hat{n}_z)$.

R is rotation matrix corresponding to rotation by θ around normal axis $\hat{n}$.

$\omega = \theta\hat{n} = (\omega_x, \omega_y, \omega_z)$ is a rotation vector, a minimal representation of 3D rotation.

- *Rotation vector to rotation matrix*

This can be done using above Rodrigues equation.

```
function (vector) -> rotation matrix
V = vector(3x1)
V_m = sqrt(V[0]^2 ...)   # vector norm.
V_r = V / V_m   # only if V_m > 0.
V_n = | 0        -V_r[2]   V_r[1] |
      | V_r[2]    0       -V_r[0] |
      | -V_r[1]   V_r[0]   0      |
return [1 0 0; 0 1 0; 0 0 1] + sin(V_m)·V_n + (1 - cos(V_m))·(V_n·V_n)
```