> **restart:**

Ejercicio 6 - Examen final 11 septiembre 2000

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Problema de cinemática 3D

> **with(linalg):**

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Warning, the protected names norm and trace have been redefined and unprotected
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> **u:=vector([-cos(theta),0,sin(theta)]);**

$$u := [-\cos(\theta), 0, \sin(\theta)]$$

> **j:=vector([0,1,0]);**

$$j := [0, 1, 0]$$

> **ju:=crossprod(j,u);**

$$ju := [\sin(\theta), 0, \cos(\theta)]$$

> **AD:=evalm(a*cos(theta)*j+a*sin(theta)*ju);**

$$AD := [a \sin(\theta)^2, a \cos(\theta), a \sin(\theta) \cos(\theta)]$$

> **Omega:=vector([-omega/tan(theta),omega/sin(theta),omega]);**

$$\Omega := \left[-\frac{\omega}{\tan(\theta)}, \frac{\omega}{\sin(\theta)}, \omega\right]$$

> **thetad:=omega/sin(theta);**

$$thetad := \frac{\omega}{\sin(\theta)}$$

> **Omegad:=evalm(map(diff,Omega,theta)*thetad);**

$$Omegad := \left[\frac{\omega^2 (1 + \tan(\theta)^2)}{\sin(\theta) \tan(\theta)^2}, -\frac{\omega^2 \cos(\theta)}{\sin(\theta)^3}, 0\right]$$

> **Omegad:=simplify(Omegad);**

$$Omegad := \left[\frac{\omega^2 \sin(\theta)}{(-1 + \cos(\theta)^2)^2}, \frac{\omega^2 \cos(\theta)}{\sin(\theta)\,(-1 + \cos(\theta)^2)}, 0 \right]$$

> **map(simplify,Omegad,{1-cos(theta)^2=sin(theta)^2});**

$$\left[\frac{\omega^2}{\sin(\theta)^3}, -\frac{\omega^2 \cos(\theta)}{\sin(\theta)^3}, 0 \right]$$

> **v[AD]:=crossprod(Omega,AD,trig);**

$$v_{AD} := \left[0, \omega\,\alpha \sin(\theta)^2 + \frac{\omega\,\alpha \sin(\theta)\cos(\theta)}{\tan(\theta)}, -\frac{\omega\,\alpha \cos(\theta)}{\tan(\theta)} - \omega \sin(\theta)\,\alpha \right]$$

> **v[AD]:=simplify(v[AD],trig);**

$$v_{AD} := \left[0, \omega\,\alpha, -\frac{\omega\,\alpha}{\sin(\theta)} \right]$$

> **v[A]:=vector([0,0,diff(a*sin(theta),theta)*thetad]);**

$$v_A := \left[0, 0, \frac{\alpha \cos(\theta)\,\omega}{\sin(\theta)} \right]$$

> **v[D]:=evalm(v[A]+v[AD]);**

$$v_D := \left[0, \omega\,\alpha, \frac{\alpha \cos(\theta)\,\omega}{\sin(\theta)} - \frac{\omega\,\alpha}{\sin(\theta)} \right]$$

> **Omegan2:=simplify((Omega[1]^2+Omega[2]^2+Omega[3]^2));**

$$Omegan2 := -2\,\frac{\omega^2}{-1 + \cos(\theta)^2}$$

> **Omegan2:=simplify(Omegan2,{1-cos(theta)^2=sin(theta)^2});**

$$Omegan2 := 2\,\frac{\omega^2}{\sin(\theta)^2}$$

> **Omegan:=sqrt(Omegan2,symbolic);**

$$Omegan := \frac{\sqrt{2}\,\omega}{\sin(\theta)}$$

> **Omegan1:=evalm(Omega/Omegan);**

$$Omegan1 := \left[-\frac{1}{2}\frac{\sqrt{2}\,\sin(\theta)}{\tan(\theta)}, \frac{1}{2}\sqrt{2}, \frac{1}{2}\sqrt{2}\,\sin(\theta)\right]$$

> **Omegan1:=map(simplify,Omegan1);**

$$Omegan1 := \left[-\frac{1}{2}\sqrt{2}\,\cos(\theta), \frac{1}{2}\sqrt{2}, \frac{1}{2}\sqrt{2}\,\sin(\theta)\right]$$

> **v[min]:=simplify(dotprod(v[A],Omegan1),symbolic);**

$$v_{min} := \frac{1}{2}\alpha\,\cos(\theta)\,\omega\,\sqrt{2}$$