# ALGEBRA LINEAL PRODUCTO CRUZ*

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<TeXmacs|1.0.6>
<style|generic>
<\body>
kolman seccion 5.1 ejercicio numero 3.
resuelto por javier lopez
\;
Sean u = i+2j-3k, v = 2i+3j+k, w = 2i-j+2k y c = -3. verificar
a. (u x v) = -(v x u)
b.u x (v+w) = u x v + u x w
c.(u x v) <with|mode|math|>= (cu) x v = u x (cv)
\;
Solucion a.
(u x v) = -(v x u)
para esto operamos realizamos el producto cruz (u x v) primero.
\
<with|prog-language|sage|prog-session|default|<\session>
<\input|>
u=vector([1,2,-3])
</input>
<\input|>
v=vector([2,3,1])
</input>
<\input|>
x=u.cross_product(v)
</input>
<\input|>
x
</input>
<\output>
<with|mode|math|<left|(>11,-7,-1<right|)>≫
</output>
<\input|>
\;
</input>
</session≫

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\
ahora operamos \ -(v x u).
<with|prog-language|sage|prog-session|default|<\session>
<\input|>
x=v.cross_product(u)
</input>
<\input|>
x
</input>
<\output>
<with|mode|math|<left|(>-11,7,1<right|)≫
</output>
<\input|>
\;
</input>
</session≫
obtenemos (u x v) = - (v x u)
Solucion b.
u x (v+w) = u x v + u x w
\ u x (v+w)\
\ operamos\
<with|prog-language|sage|prog-session|default|<\session>
<\input|>
w=vector([2,-1,2])
</input>
<\input|>
x=u.cross_product(v+w)
</input>
<\input|>
x
</input>
<\output>
<with|mode|math|<left|(>12,-15,-6<right|)≫
</output>
<\input|>
\;
</input>
</session≫
ahora operamos u x v + u x w.
<with|prog-language|sage|prog-session|default|<\session>
<\input|>
x=u.cross_product(v)+u.cross_product(w)
</input>
<\input|>
x
</input>
<\output>
<with|mode|math|<left|(>12,-15,-6<right|)≫
</output>
\;
</session≫

obtenemos u x (v+w) = u x v + u x w
Solucion c.\
(u x v) <with|mode|math|>= (cu) x v = u x (cv)
del la solucion del a tenemos que (u x v) =
<with|mode|math|<left|(>11,-7,-1<right|)≫, por consiguiente operaremos
\ (cu) x v\
<with|prog-language|sage|prog-session|default|<\session>
<\input|>
c=-3
</input>
<\input|>
x=(c*u).cross_product(v)
</input>
<\input|>
x
</input>
<\output>
<with|mode|math|<left|(>-33,21,3<right|)≫
</output>
<\input|>
\;
</input>
</session≫
ahora operamos u x (cv)
<with|prog-language|sage|prog-session|default|<\session>
<\input|>
<\input|>
x=u.cross_product(c*v)
</input>
<\input|>
x
</input>
<\output>
<with|mode|math|<left|(>-33,21,3<right|)≫
</output>
<\input|>
\;
</input>
</input>
</session≫
\;
Obtenemos (u x v) <with|mode|math|>= (cu) x v = u x (cv)
\;
</body>