Math 344 Homework #4

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(11a.) Evaluate $\det\left(\begin{bmatrix} \lambda-1 & 2 \\ 3 & \lambda-2 \end{bmatrix}\right)$

$\det\begin{bmatrix} \lambda-1 & 2 \\ 3 & \lambda-2 \end{bmatrix} = (\lambda-1)(\lambda-2)-6$

$= \lambda^2-3\lambda+2-6 = \boxed{\lambda^2-3\lambda-4}$

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16. Is $\det(AB)=\det(BA)$?

$\det(AB)=\det(A)\det(B)=\det(B)\det(A)=\det(BA)$.

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(5a.) $\vec{u}=(2,3)$ $\vec{v}=(-2,5)$

$\vec{u}+\vec{v}=(2,3)+(-2,5)=\boxed{(0,8)}$

$\vec{u}-\vec{v}=(2,3)-(-2,5)=\boxed{(4,-2)}$

$2\vec{u}=2(2,3)=\boxed{(4,6)}$

$3\vec{u}-2\vec{v}=3(2,3)-2(-2,5)=(6,9)-(-4,10)=\boxed{(10,-1)}$

(19b.) Find a unit vector in the direction of $\vec{x}$.

$x=(-2,-3)$

$\|\vec{x}\|=\sqrt{(-2)^2+(-3)^2}=\sqrt{4+9}=\sqrt{13}$

unit vector $=\left(\frac{-2}{\sqrt{13}},\frac{-3}{\sqrt{13}}\right)$

21c. Find the cosine of the angle between each pair of vectors.

$\vec{u} = (-3, -4) \quad \vec{v} = (4, -3)$

$$\cos\theta = \frac{\vec{u} \cdot \vec{v}}{\|\vec{u}\| \cdot \|\vec{v}\|}$$

$$\cos\theta = \frac{(-3, -4) \cdot (4, -3)}{(\sqrt{9+16})(\sqrt{16+9})}$$

$$= \frac{(-12 + 12)}{\sqrt{25}\ \sqrt{25}} = \frac{0}{25} = \boxed{0.}$$