Chem. 540
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Math Problem 9

Consider the square matrices

$$\mathbf{A} = \begin{pmatrix} 1 & 3 & 1 \\ 2 & -1 & 0 \\ 0 & 5 & 2 \end{pmatrix}, \quad \mathbf{B} = \begin{pmatrix} 2 & 0 & -2 \\ 4 & 1 & 1 \\ 1 & 3 & 2 \end{pmatrix}.$$

(a) Calculate the product $\mathbf{A}\cdot\mathbf{B}, \mathbf{B}\cdot\mathbf{A}$. Do these matrices commute?

(b) Calculate $\det \mathbf{A}, \det \mathbf{B}$ and $\det(\mathbf{A}\cdot\mathbf{B}), \det(\mathbf{B}\cdot\mathbf{A})$.

(c) Find $\mathbf{A}^{\mathrm{T}}$ and $\mathbf{B}^{\mathrm{T}}$ and calculate their determinants. Also calculate $\det(\mathbf{A}^{\mathrm{T}}\cdot\mathbf{B})$.