Phys 3122A, Homework 2, problem 3 solution:

a) Counter example to show $(\vec{A}\cdot\vec{B})\cdot\vec{C} \neq \vec{A}\cdot(\vec{B}\cdot\vec{C})$:

Let try $\vec{A}=\vec{B}=\hat{x}$ and $\vec{C}=\hat{y}$, then the left hand side gives $\hat{y}$ while the right hand side gives $\vec{0}$. So clearly the vector dot product is not associative.

b) Counter example to show $(\vec{A}\times\vec{B})\times\vec{C} \neq \vec{A}\times(\vec{B}\times\vec{C})$:

Let try $\vec{A}=\vec{B}=\hat{x}$ and $\vec{C}=\hat{y}$, then the left hand side gives $\vec{0}$ while the right hand side gives $-\hat{y}$. So clearly the vector cross product is not associative.