Homework 4

1. × (20 points) Expand $mc^2 \left(1 - \frac{v^2}{c^2}\right)^{-\frac{1}{2}}$ into Binomial form

2. × (20 points) Show that scalar product $\vec{A} \cdot \vec{B} = |A|\,|B| \cos(\vartheta)$ where ϑ is the relative angle.

3. × (40 points) Using Levi - Civita representation of cross product prove (a) $\vec{A} \times \vec{B} = -\vec{B} \times \vec{A}$

(b) $\vec{A} \cdot \left(\vec{B} \times \vec{C}\right) = \vec{B} \cdot \left(\vec{C} \times \vec{A}\right) = \vec{C} \cdot \left(\vec{A} \times \vec{B}\right)$

(c) $\vec{A} \times \left(\vec{B} \times \vec{C}\right) = \vec{B}\left(\vec{A} \cdot \vec{C}\right) - \vec{C}\left(\vec{A} \cdot \vec{B}\right)$

4. × (20 points) Prove that $\left|\vec{A} \times \vec{B}\right| = |A|\,|B| \sin(\vartheta)$ where ϑ is the relative angle.

5. × (40 points) Solve problems (*3.2.13 and 3.2.14