Problem 1. – *Lorenty transformation again*
Show, that the following values transform under Lorentz-transformation as stated:

$\overline{\Psi}\Psi$	Scalar
$\overline{\Psi}\gamma_5\Psi$	Pseudo-scalar
$\overline{\Psi}\gamma_\mu\Psi$	Lorentz-Vector
$\overline{\Psi}\gamma_5\gamma_\mu\Psi$	axial Lorentz-vector
$\overline{\Psi}\sigma^{\mu\nu}\Psi$	second order Lorentz-tenzor

Problem 2. – *Well potential*
Consider a potential $V = \begin{cases} 0\,, & |x| < \frac{a}{2} \\ V_0\,, & |x| \geq \frac{a}{2} \end{cases}$. Discuss the spectrum of $\widehat{H}$ qualitatively for
(a) $|V_0| > 2m_0c^2$
(b) in case of $\widehat{H} = \overrightarrow{\alpha}\,\overrightarrow{p} + \beta m_0c^2 + \beta V$.

Problem 3. – *Step potential*
Consider a one dimensional potential $V = \begin{cases} 0\,, & z < 0 \\ V_0\,, & z \geq 0 \end{cases}$ with a plane wave coming in from the left, with energy E, $E^2 = m_0^2c^4 + p^2c^2$. Find the flux density of the reflected and "transmitted"part of the wave in case of a potential $V_0 > E + m_0c^2 > 2m_0c^2$.