

Homework 1

Kinks in sine-Gordon theory: consider a theory of a single scalar field in 1+1 dimensions with the canonical kinetic term and a potential:

$$V(\phi) = A \left(1 - \cos \frac{2\pi\phi}{a} \right)$$

The vacua of this theory are at $\phi = na$ with $n \in \mathbb{Z}$. Find the explicit form of the kink solution $\phi(x)$ that interpolates between two adjacent vacua and its energy. Write the answer in terms of the effective mass parameter $m = 2\pi\frac{\sqrt{A}}{a}$ and the coupling constant $\lambda = 16\pi^4\frac{A}{a^4}$.