1 Problems

**Putnam 1979/B1.** Does there exist a line which is perpendicular to both the curves \( y = \sinh x \) and \( y = \cosh x \)? Recall that
\[
\sinh x = \frac{e^x - e^{-x}}{2}, \quad \cosh x = \frac{e^x + e^{-x}}{2}.
\]

**Putnam 1979/B2.** Let \( 0 < \alpha < \beta \) be real parameters. Calculate
\[
\lim_{\lambda \to 0} \left( \int_0^1 (\beta x + \alpha(1-x))^\lambda \, dx \right)^{1/\lambda}.
\]

**Putnam 1979/B3.** Let \( \mathbb{F} \) be a finite field with \( n \) elements, where \( n \) is odd, and suppose that \( x^2 + bx + c \) is an irreducible polynomial over \( \mathbb{F} \). For how many elements \( d \in \mathbb{F} \) is \( x^2 + bx + d \) irreducible?