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On a ternary Diophantine problem with mixed powers of primes

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Let $1 < k < 33 / 29$. We prove that if λ_1 , λ_2 and λ_3 are non-zero real numbers, not all of the same sign and that λ_1 / λ_2 is irrational and ϖ is any real number, then for any $\epsilon > 0$ the inequality $|\lambda_1 p_1 + \lambda_2 p_2^2 + \lambda_3 p_3^k + \varpi| \leq \max_j |\lambda_j| \epsilon^{-(33 - 29k) / (72k) + \epsilon}$ has infinitely many solutions in prime variables p_1, \dots, p_k .

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