On prime-order elliptic curves with embedding degrees $k = 3, 4$ and $6$

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Abstract. We further analyze the solutions to the Diophantine equations from which prime-order elliptic curves of embedding degrees $k = 3, 4$ or $6$ (MNT curves) may be obtained. We give an explicit algorithm to generate such curves. We derive a heuristic lower bound for the number $E(z)$ of MNT curves with $k = 6$ and discriminant $D \leq z$, and compare this lower bound with experimental data.

Keywords: Elliptic curves, pairing-based cryptosystems, embedding degree, MNT curves.