

# My formalization project

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**Lemma 1.**  $m_M(x) \leq 2$  .

**Lemma 2.**  $m_M(x) \leq x^n - 1$  .

**Lemma 3.**

**Lemma 4.**  $m_M(x) \leq \sum_{i=1}^n \Phi_i(x)$  .

**Lemma 5.**  $n \leq \Phi_n(x)$  ,  $\phi(n) \leq \Phi_n(x)$  .

**Lemma 6.**

**Lemma 7.**

**Lemma 8.**

**Lemma 9.**

**Lemma 10.**

**Lemma 11.**

**Lemma 12.**

**Lemma 13.**

$$\Phi_1(x), \Phi_2(x), \Phi_3(x), \Phi_4(x), \Phi_6(x) \leq m_M(x) .$$

**Lemma 14.**  $m_M(x) \leq \Phi_1(x) + \Phi_2(x) + \Phi_3(x) + \Phi_4(x) + \Phi_6(x)$  .

**Lemma 15.**  $M \leq m_M(x)$

$$\Phi_1(x), \Phi_2(x), \Phi_3(x), \Phi_4(x), \Phi_6(x), \Phi_1(x)\Phi_2(x) \leq m_M(x) .$$

**Lemma 16.**

**Theorem 17.**  $GL(2, \mathbb{Q})$  has elements of order  $1, 2, 3, 4, 6$  .

**Definition 18.**

**Theorem 19.**  $n = 1, 2, 3, 4, 6$  ,  $n \leq \text{order of } GL(2, \mathbb{Q}) \leq M$  .