

Magnets

Fenix Science Club

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Task

A familiar toy consists of donut-shaped permanent magnets (magnetization parallel to the axis), which slide frictionlessly on a vertical rod (Figure). Treat the magnets as dipoles, with mass m_d and dipole moment m .

- (a) If you put two back-to-back magnets on the rod, the upper one will “float”—the magnetic force upward balancing the gravitational force downward. At what height (z) does it float?
- (b) [HARD Problem] If you now add a third magnet (parallel to the bottom one), what is the ratio of the two heights? (Determine the actual number, to three significant digits.)

