A simple demonstration of a general rule for the variation of magnetic dipole field with distance

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We describe a simple experiment demonstrating the variation in magnitude of a magnetic field with distance. The method described requires only an ordinary magnetic compass and a permanent magnet. The proposed graphical analysis illustrates a unique method for deducing a general rule of magnetostatics. The method uses an ordinary geologic compass, a small circular magnet, and a bar magnet about 60 cm long. The small magnet is similar to those commonly used on household bulletin boards or refrigerator doors. The long bar magnet is a steel bar magnetized by a long solenoid coil with the application of a small current.

The experiment described herein is unique in that it is designed to permit students to infer a general law from their observations and requires no special instruments. The principle of this experiment is based on electromagnetism but is more readily understood, as it uses only ratios of measured properties. Some logarithmic and trigonometric calculations, easily computed with a pocket calculator, are required. No special calculations requiring a computer are necessary.