

Example

What launch speed is needed to completely escape Earth?

$$v = \sqrt{\frac{2G_N M_{\oplus}}{R_{\oplus}}}$$

$$M_{\oplus} = 5.974 \times 10^{24} \text{ kg}$$

$$R_{\oplus} = 6.378 \times 10^6 \text{ m}$$

$$v = \sqrt{\frac{2(6.67 \times 10^{-11})(5.974 \times 10^{24})}{6.378 \times 10^6 \text{ m}}}$$

$$= 11,200 \text{ m/s}$$

$$= 11.2 \text{ km/s}$$

$$= 40,241 \text{ mph}$$