Determine the velocity of escape on the surface of the planet Mars. It is given that the mass of Mars is 1/9 and its radius is 1/2 that of the earth.

Solution:

The escape velocity by definition

$$v_e = \sqrt{\frac{2GM}{R}}.$$

Thus

$$v_e = \sqrt{\frac{2G \times \frac{1}{9}M_{\text{Earth}}}{\frac{1}{2}R_{\text{Earth}}}} = \frac{2}{3}\sqrt{\frac{GM_{\text{Earth}}}{R_{\text{Earth}}}} = \frac{2}{3}(v_o)_{\text{Earth}},$$

where $(v_o)_{\text{Earth}} = 7.9$ km/s is the orbital velocity for the Earth.

Finally the escape velocity on the surface of the planet Mars

$$v_e = \frac{2}{3} \times 7.9 = 5.27 \frac{\text{km}}{\text{s}}.$$

Answers: $5.27 \frac{\text{km}}{\text{s}}$.