

# TM5 Pr 5.3

ASSUMING AIR RESISTANCE IS UNIMPORTANT, CALCULATE THE ESCAPE VELOCITY FROM EARTH.

$$v = 0 \rightarrow \infty$$

USE ENERGY

$$E_{\text{SURFACE}} = E_{\infty}$$

$$\frac{1}{2} m v_e^2 - \frac{GMm}{R_E} = 0 + 0$$

$$\Rightarrow \frac{1}{2} v_e^2 = \frac{GM}{R_E}$$

$$\boxed{v_e = \sqrt{\frac{2GM}{R_E}}}$$

ESCAPE VELOCITY



GET A NUMERICAL RESULT

$$M_E = 5.98 \times 10^{24} \text{ kg}$$

$$R_E = 6.38 \times 10^6 \text{ m}$$

$$\Rightarrow v_e = \sqrt{\frac{2(6.67 \times 10^{-11})(5.98 \times 10^{24})}{6.38 \times 10^6}}$$

$$= \sqrt{1.25 \times 10^8}$$

$$= 1.12 \times 10^4 \frac{\text{m}}{\text{s}}$$

$$\Rightarrow \boxed{v_e = 11.2 \frac{\text{km}}{\text{s}}}$$