86. (a) We use Eq. 14-27:

$$v_{\text{esc}} = \sqrt{\frac{2GM}{R}} = \sqrt{\frac{2\,(6.67\times10^{-11})\,(1.99\times10^{30})}{1.50\times10^{11}}} = 4.21\times10^{4}\ \text{m/s}\ .$$

(b) Earth's orbital speed is gotten by solving Eq. 14-41:

$$v_{\text{orb}} = \sqrt{\frac{GM}{R}} = \sqrt{\frac{(6.67\times10^{-11})\,(1.99\times10^{30})}{1.50\times10^{11}}} = 2.97\times10^{4}\ \text{m/s}\ .$$

The difference is therefore $v_{\text{esc}} - v_{\text{orb}} = 1.23\times10^{4}$ m/s.

(c) To obtain the speed (relative to Earth) mentioned above, the object must be launched with initial speed

$$v_0 = \sqrt{(1.23\times10^{4})^2 + 2\frac{GM_E}{R_E}} = 1.66\times10^{4}\ \text{m/s}\ .$$

However, this is not precisely the same as the speed it would need to be launched at if it is desired that the object be just able to escape the solar system. The computation needed for that is shown below.
Including the Sun's gravitational influence as well as that of Earth (and accounting for the fact that Earth is moving around the Sun) the object at moment of launch has energy

$$K + U_E + U_S = \frac{1}{2}m\,(v_{\text{launch}} + v_{\text{orb}})^2 - \frac{GmM_E}{R_E} - \frac{GmM_S}{R}$$

which must equate to zero for the object to (barely) escape the solar system. Consequently,

$$v_{\text{launch}} = \sqrt{2G\left(\frac{M_E}{R_E} + \frac{M_S}{R}\right)} - v_{\text{orb}} = \sqrt{2\,(6.67\times10^{-11})\left(\frac{5.98\times10^{24}}{6.37\times10^{6}} + \frac{1.99\times10^{30}}{1.50\times10^{11}}\right)} - 2.97\times10^{4}$$

which yields $v_{\text{launch}} = 1.38\times10^{4}$ m/s.