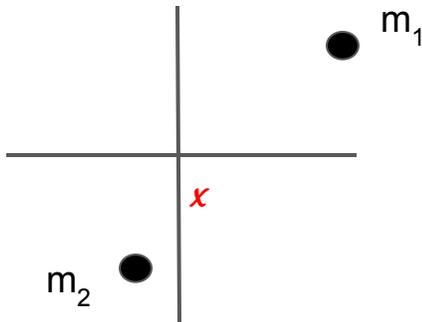
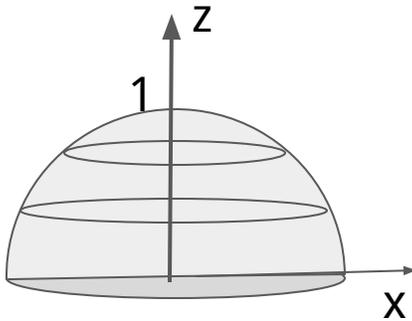


**(1) X marks the spot.**

Determine the center of mass of the two particles shown in the figure. ( $m_1 = 1$  kg;  $m_2 = 3$  kg) Put an X accurately on the figure, at the center of mass point.

**(2) The center of mass of a hemisphere**

Determine the coordinates ( $x_c$   $y_c$   $z_c$ ) of the center of mass of the hemisphere (which has uniform density) shown in the figure.



$$z_c = 3/8$$

(3) Consider a single stage rocket with these parameters:

$$m_0 = 2,500,000 \text{ kg}$$

$$m_{\text{fuel}} = 2,400,000 \text{ kg}$$

$$\text{thrust} = 40,000,000 \text{ N}$$

$$\text{burn time} = 300 \text{ sec}$$

Would it escape from Earth's gravity?  
(Prove your answer.)

$$\text{at burnout } v = 13.1 \text{ m/s} > \text{escape velocity}$$