

## Problems

Any satellite orbiting the earth must satisfy this equation

$$v = \sqrt{\frac{5.18 \times 10^{12}}{d + r}}$$

where  $v$  is the velocity of the satellite in kilometers per hour,  $d$  is the height of orbit above earth's surface in kilometers, and  $r$  is the radius of the earth in kilometers. Write the expression to compute the height of Geostationary Orbit above the earth's surface in kilometers.

## Solution

We have two equations

$$v^2 = \frac{5.18 \times 10^{12}}{d + r} \quad (1)$$

$$v = \frac{2\pi(d + r)}{24} \quad (2)$$

Substituting (2) into (1), we have

$$d = \sqrt[3]{\frac{5.18 \times 10^{12} \times 24^2}{(2\pi)^2}} - r \quad (3)$$