

# Work Done on Satellites

Wednesday, April 25, 2018 9:43 AM

When raising a satellite (rocket lift off), the work done on the object is equal to its change in energy



Find the work done to raise a 4000kg satellite from the surface of the moon to a height of  $9 \times 10^6 \text{ m}$  from its center.

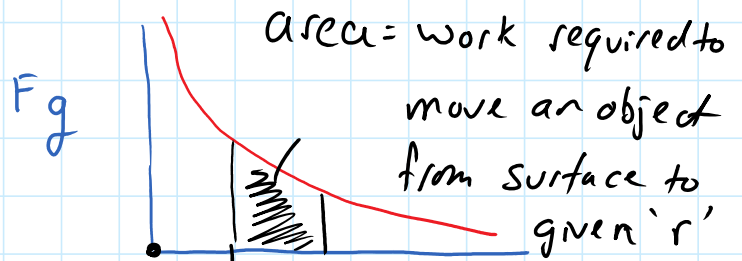
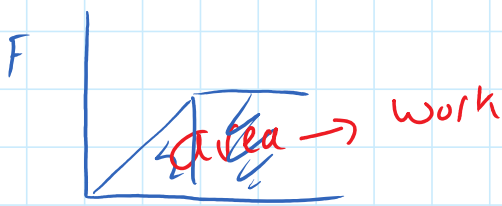


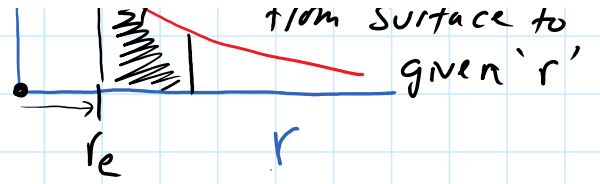
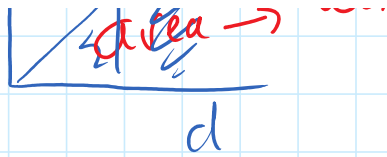
$$\begin{aligned}
 W &= \Delta E = \Delta E_p & E_p &= -\frac{Gm_1m_2}{r} \\
 &= E_{p_f} - E_{p_0} \\
 &= -\frac{(6.67 \times 10^{-11})(7.35 \times 10^{22} \text{ kg})(4000 \text{ kg})}{(9 \times 10^6 \text{ m})} - \frac{(6.67 \times 10^{-11})(7.35 \times 10^{22})(4000)}{1.74 \times 10^6 \text{ m}}
 \end{aligned}$$

$$= -2.18 \times 10^9 \text{ J} + 1.13 \times 10^{10} \text{ J}$$

$$= 9.1 \times 10^9 \text{ J} \quad \text{positive cause work was done!}$$

$F_g$  vs  $d$  graph





$$F_g = \frac{6m \cdot m}{r^2}$$