

1. [9 points] When a rocket leaves the gravitational influence of the Earth, it could travel infinitely far away (if we ignore the effects of other celestial bodies). When a rocket of mass  $m$  kilograms is  $h$  meters above the surface of the Earth, it has a weight of  $w = 9.8m \left( \frac{6,400,000}{6,400,000+h} \right)^2$  Newtons. Here, 6,400,000 is the radius of the Earth in meters, and 9.8 is the gravitational constant in  $\text{m/s}^2$ .
  - a. [3 points] Approximately how much work is required to lift the rocket  $\Delta h$  additional meters when it is already  $h$  meters above the surface of the Earth? Your answer may include  $m$ ,  $h$ , and  $\Delta h$ .
  
- b. [6 points] Figure out the work required to lift the rocket from the surface of the Earth to a height of infinity. Your answer may include  $m$ .