Astronomy 190 Homework #1 Winter 2009

Part I

Planet	V_{escape} (km/s)
Earth	11.2
Moon	2.4
Mars	5.0
Sun	617.7

The table on the right shows the escape velocity for a few worlds in our solar system. The escape velocity is the ΔV a rocket needs to completely escape from a world. The rocket equation can be rewritten to find how much payload we can lift for a given ΔV and u:

$$\frac{M}{M_0} = e^{-\Delta V/u} = \exp(-\Delta V/u)$$

M/M_0 is the fraction of the total rocket mass that is payload. For example, if $M/M_0 = 0.05$ that means that 5% of the rocket's mass can be payload.

For each of the four worlds above, calculate what fraction of your rocket can be payload if you want to escape from that world. Assume that $u = 3$ km/s.

`Hint: Try typing exp(-1.1/2.0) into Google`

Part II

Five US Surveyor robot spacecrafts landed on the Moon and collected data before the first Apollo landing. For each of the three missions listed below:

1. Describe what the landing site looked like.
2. Describe what types of rocks you would expect at that site.
3. Describe least one thing we learned about the Moon that we did not know before the mission.

Please list the references that you used (I do not care about how you format your references). Do not limit yourself to the textbook/wikipedia. They are good starting points, but there is a lot more out there. Use at least one reference that is not the textbook/wikipedia.

Surveyor Spacecrafts:

- Surveyor 3 - Landed: Apr 20, 1967
- Surveyor 6 - Landed: Nov 10, 1967
- Surveyor 7 - Landed: Jan 10, 1968

Due: Tue Jan 23 in class (−2% for every hour late)