

Problem 1

As shown in the picture below, Earth is about 3.1 million miles closer to the Sun during January than it is during July. For the following questions, consider only the Earth and Sun, ignoring everything else in the Solar System.

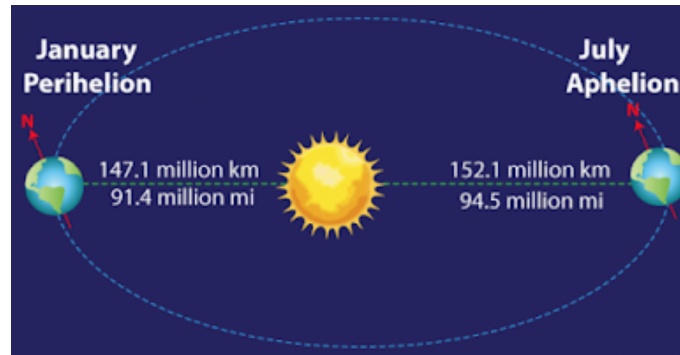


Image source: timeanddate.

- (a) Draw a graph of the potential energy of the Earth-Sun system, U vs. r , where r is the distance between the Earth and the Sun.



- (b) During which month is the potential energy of the Earth-Sun system smallest?

January

- (c) During which month is the total energy of the Earth-Sun system largest?

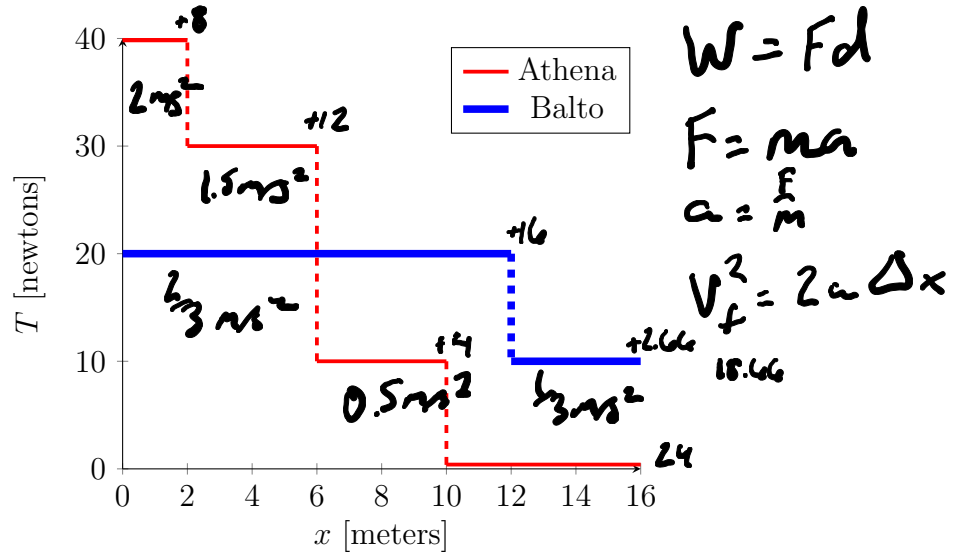
They're the same

- (d) During which month is the kinetic energy of Earth smallest?

July

Problem 2

Two huskies, Athena and Balto, are each pulling a sled starting from rest across some packed snow which has negligible friction. The masses of each sled are 20 kg (Athena's) and 30 kg (Balto's), and the massless rope connecting each dog to their sled is approximately horizontal. The graph below shows the tension that each dog applies to their sled as a function of position.



- (a) Over what position(s), if any, was Athena's sled traveling with constant speed?

10 to 16

- (b) Over what position(s), if any, was Balto's sled slowing down?

None

- (c) Which husky did more work on their sled over these 16 m?

Balto

- (d) Whose sled had the larger speed at the $x = 16$ m mark?

Athena