

AP Physics 1

2.6 – Newton’s Universal Law of Gravitation

Assessment

Name: _____

Period: _____

- 1) A 3.08×10^4 kg meteorite is on exhibit in New York City. Suppose this meteorite and another meteorite are separated by 1.27×10^7 m (a distance equal to Earth’s average diameter). If the gravitational force between them is 2.88×10^{-16} N, what is the mass of the second meteorite?
- 2) In 1989, a cake with a mass of 5.81×10^4 kg was baked in Alabama. Really. Suppose a cook stood 25.0 m from the cake. The gravitational force exerted between the cook and the cake was 5.0×10^{-7} N. What was the cook’s mass?
- 3) The largest diamond ever found has a mass of 621 g. If the force of gravitational attraction between this diamond and a person with a mass of 65.0 kg is 1.0×10^{-12} N, what is the distance between them?
- 4) The passenger liners Carnival Destiny and Grand Princess, both now in service, have a mass of about 1.0×10^8 kg each. How far apart must these two ships be to exert a gravitational attraction of 1.0×10^{-3} N on each other?
- 5) In 1874, a swarm of locusts descended on Nebraska. The swarm’s mass was estimated to be 25×10^9 kg. If this swarm were split in half and the halves separated by 1.0×10^3 km, what would the magnitude of the gravitational force between the halves be?
- 6) Deimos, a satellite of Mars, has an average radius of 6.3 km. If the gravitational force between Deimos and a 3.0 kg rock at its surface is 2.5×10^{-2} N, what is the mass of Deimos?
- 7) There exists in space a geometric equilateral triangle, meaning it is made of lines of only 1 dimension. This region of space is midway between the Milky Way Galaxy and the Andromeda Galaxy, so no external forces, especially gravitational, may be considered. Two masses (2.65 kg each) are placed at two points of the equilateral triangle, 1.3 m from each other. A third mass, m_3 , is released from rest at the third corner of the triangle. Find the magnitude of the initial acceleration on m_3 .
- 8) The moon Shazbot orbits the planet Webberoth-1. As Shazbot orbits, it is measured that the maximum gravitational force on Shazbot by Webberoth-1 is 13% greater than the minimum force. Considering only the magnitude of the displacement vector \mathbf{r} , which spans from center-to-center, find r_{max}/r_{min} .