Name _____Answer Key_____ Date _____

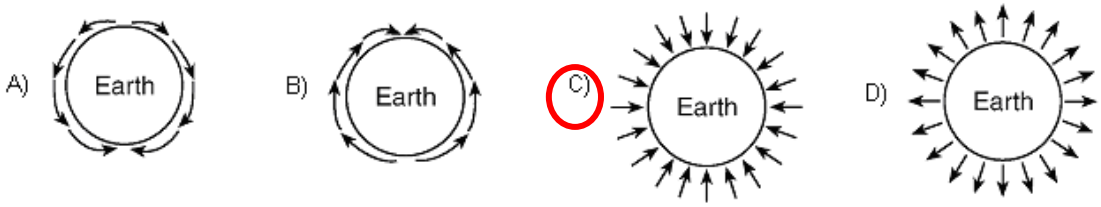
Honors Physics Gravity and Circles WS #1

Period _____ Mrs. Nadworny

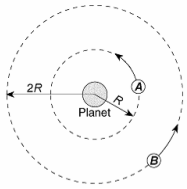
Gravitational Force

Directions – Read textbook pages 263 – 264. Solve the following problems using the GUESS method and correct significant figures. Be sure to show ALL work!

1. Which diagram best represents the gravitational field lines surrounding Earth?



2. The diagram below represents two satellites of equal mass, A and B, in circular orbits around a planet.



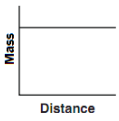
Compared to the magnitude of the gravitational force between satellite A and the planet, the magnitude of the gravitational force of attraction between satellite B and the planet is

A) 1/4th as great B) half as great C) twice as great D) four times as great

3. A space probe is launched into space from Earth's surface. Which graph represents the relationship between the mass of the space probe and the distance between the space probe and the center of Earth?

(A) 

(B) 

(C) 

(D) 

4. An object weighs 100. Newtons on Earth's surface. When it is moved to a point one Earth radius above Earth's surface, it will weigh

(A) 25.0 N (B) 50.0 N (C) 100. N (D) 400. N

5. Deimos, a satellite of Mars, has an average radius of 6.3 km and a mass of 5.0 x10^{15} kg. Calculate the gravitational force applied to a rock with a mass of 5.0 kg that lies of the surface of Deimos. [Hint: Watch your units!]

$$F_G = \frac{Gm_1m_2}{r^2} = \frac{(6.67\times10^{-11}\ \frac{N\cdot m^2}{kg^2})(5.0\times10^{15}\,kg)(5.0kg)}{(6300m)^2} = 0.042N \text{ down}$$

Continued on next page

6. In 1989, a cake with a mass of 5.81 x 10^4 kg was baked in Alabama. Suppose the cook stands 25.0 m from the cake. The gravitational force exerted between the cook and the cake is 5.00 x 10^{-7} N. What is the cook's mass?

$$m_1 = \frac{F_G r^2}{G m_2} = \frac{(5.00\times10^{-7}\,N)(25m)^2}{(6.67\times10^{-11}\,\frac{N\cdot m^2}{kg^2})(5.81\times10^4\,kg)} = 80.6kg$$

7. Ty Knotts weighs 820 N on planet Earth. What does Ty weigh on planet Alpha if planet Alpha has the same mass as Earth, but is three times larger? [Hint: This is the new "What Happens When… type of problem.]

$F_G = \frac{Gm_1m_2}{r^2} = \frac{Gm_1m_2}{(3r)^2} = \frac{Gm_1m_2}{9r^2}$

The new F_G is 1/9 the original

New F_G = 91 N

OR

$F_G = \frac{Gm_1m_2}{r^2} = \frac{1\cdot1\cdot1}{(3)^2} = \frac{1}{9}$

The new F_G is 1/9 the original

New F_G = 91 N

8. Trudy Ages weighs 670 N on planet Earth. What does she weigh on planet Beta if planet Beta has the same radius as Earth, but twice the mass? [Hint: This is the new "What Happens When… type of problem.]

$F_G = \frac{Gm_1m_2}{r^2} = \frac{Gm_1(2)m_2}{r^2} = 2\frac{Gm_1m_2}{r^2}$

The new F_G is twice the original

New F_G = 1300 N

OR

$F_G = \frac{Gm_1m_2}{r^2} = \frac{1\cdot1\cdot2}{1^2} = 2$

The new F_G is twice the original

New F_G = 1300 N

Answers in size order: 0.042, 80.6, 91, 1300