Physics 112
Quiz #2 *[12 points]*
## September 6, 2002

Name_____

1. A 5-kg lead sphere is hanging 12 m from a 500-kg lead sphere. How does the gravitational force exerted by the 5-kg sphere <u>on the 500-kg sphere</u> compare with the magnitude of the gravitational force exerted by the 500-kg sphere <u>on the 5-kg sphere</u>? The forced exerted by the 5-kg sphere <u>on the 500-kg sphere</u> is:

    A. 100 times larger
    B. 10 times larger
    C. exactly the same
    D. 10 times smaller
    E. 100 times smaller

2. Suppose the distance between the spheres in #1 were somehow changed instantaneously to 36 m. What would happen to the magnitude of the gravitational force exerted by the 5-kg sphere on the 500-kg sphere?

    A. It would become 9 times larger than it was before.
    B. It would become 3 times larger than it was before
    C. It would be exactly the same as it was before.
    D. It would become one-third as large as it was before.
    E. It would become one-ninth as large as it was before.

3. Suppose the distance between the two spheres in #1 remained the same, but somehow the mass of the smaller sphere was changed to 20 kg. What would happen to the magnitude of the gravitational force exerted on the 500-kg sphere?

    A. It would become four times larger than it was before.
    B. It would become twice as large as it was before
    C. It would be exactly the same as it was before.
    D. It would become one-half as large as it was before.
    E. It would become one-fourth as large as it was before.

4. A. Which arrow points in the *direction* of the gravitational force exerted <u>by</u> mass #1 <u>on</u> the mass #3?

    A B C D E F G H
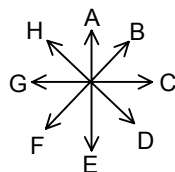
    B. Which arrow points in the *direction* of the gravitational force exerted <u>by</u> mass #2 <u>on</u> mass #1?

    A B C D E F G H

5. *[2 points]* In the diagram shown, three equal masses are shown. Draw and label (with the appropriate letter) <u>three</u> arrows, as follows:
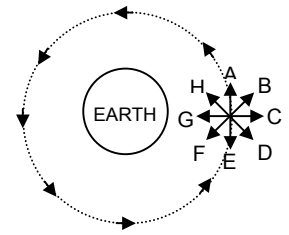
    A. the gravitational force of #2 <u>on</u> #1
    B. the gravitational force of #3 <u>on</u> #1
   C. the <u>net</u> gravitational force acting on #1

    Make sure that the lengths of the arrows you draw are proportional to the magnitudes of the forces they represent!

6. A satellite is orbiting the earth in a circular path as shown; the small arrows indicate its direction of motion. Which large arrow represents the gravitational force by the earth **_on_** the satellite when it is located at the position shown?

      A   B   C   D   E   F   G   H

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7. A rocket is launched from earth at greater than the "escape velocity." This means that it continues on out into space, moving farther and farther away from the earth. Then the magnitude of the earth's gravitational force acting on the rocket:
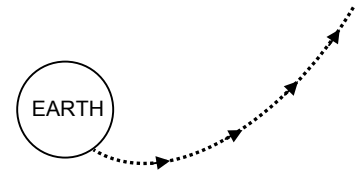
A. will eventually equal some constant value, greater than zero.
B. will eventually be exactly equal to zero, when the rocket reaches some particular distance from the earth.
C. will get smaller and smaller as the rocket gets farther away from the earth, but will never quite reach zero.

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8. Which of these diagrams most closely represents the gravitational forces that the earth and moon exert **_on each other_**? (Note: The mass of the earth is about 80 times larger than that of the moon.)


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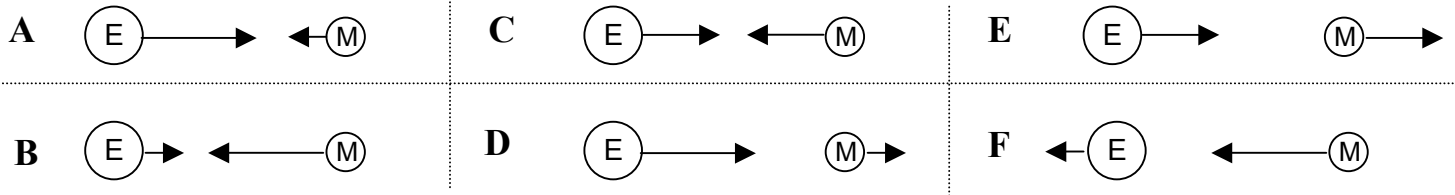
9. What can you say about the magnitude of the gravitational force on the 3 kg sphere in these three situations? The magnitude of the gravitational force on the 3 kg sphere is:

A. largest in I
B. largest in II
C. largest in III
D. equal in I and II, but larger than in III
E. equal in II and III, but larger than in I
F. equal in all three cases

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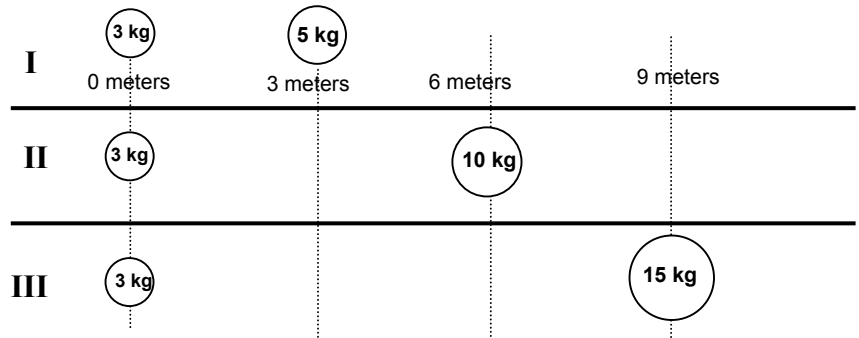
10. In diagram #1, a large mass "M" is near to mass "m." In diagram #2, a smaller mass "M_2" has moved between the other two masses. What will happen to the magnitude of the **_net gravitational force_** acting on mass "m"?
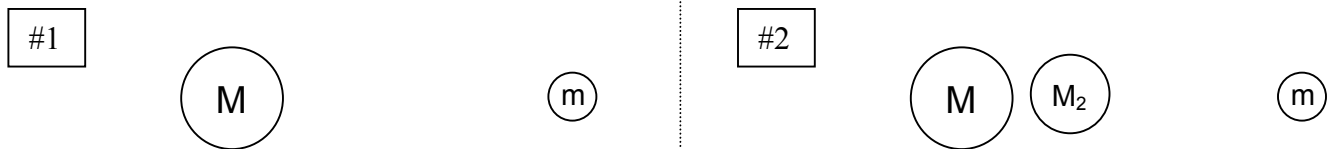
A. It will increase, due to the force of the additional mass M_2.
B. It will stay exactly the same as it was in diagram #1.
C. It will decrease, because the mass M_2 shields some of the force originally coming from mass M.
D. It is not possible to say whether it will increase, decrease, or remain the same, with the given information.

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11. Which arrow best represents the direction of the **_net gravitational force_** acting on mass #2 below?   (all masses are equal)