WebAssign
CH03-HW01-SP12 (Homework)

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PHYS 172-SPRING 2012, Spring 2012
Instructor: Virendra Saxena

Current Score : 24 / 25 **Due :** Tuesday, January 24 2012 11:59 PM EST

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1. 1/1 points | Previous Answers MI3 3.1.X.026

Match the process with the fundamental interaction responsible for this process.

A neutron outside a nucleus decays into a proton, electron, and antineutrino	The weak interaction
The Earth pulls on the Moon	The gravitational interaction
Protons in a nucleus repel each other	The electromagnetic interaction
Protons and neutrons attract each other in a nucleus	The strong interaction

- *Read the eBook*
- Section 3.1

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2. 2/2 points | Previous Answers MI3 3.2.X.031

The mass of the Sun is 2×10^{30} kg, and the mass of Jupiter is 1.9×10^{27} kg. The distance from the Sun to Jupiter is 7.8×10^{11} m.

(a) Calculate the magnitude of the gravitational force exerted by the Sun on Jupiter.
4.18e23 N

(b) Calculate the magnitude of the gravitational force exerted by Jupiter on the Sun.
4.18e23 N

- *Read the eBook*
- Section 3.2

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3. 4/5 points | Previous Answers MI3 3.3.X.039

(a) Calculate the magnitude of the gravitational force exerted by the Moon on a 75 kg human standing on the surface of the Moon. (The mass of the Moon is 7.4×10^{22} kg and its radius is 1.7×10^{6} m.)
128.67 N

(b) Calculate the magnitude of the gravitational force exerted by the human on the Moon.
128.67 N

(c) For comparison, calculate the approximate magnitude of the gravitational force of this human on a similar human who is standing 4 meters away.

2.36e-8 ✓ N

(d) What approximations or simplifying assumptions must you make in these calculations? (Note: Some of these choices are false because they are wrong physics!)

- ☐ Treat the humans as though they were points or uniform-density spheres.
- ☑ Treat the Moon as though it were spherically symmetric.
- ☑ Ignore the effects of the Sun, which alters the gravitational force that one object exerts on another.
- ☑ Use the same gravitational constant in (a) and (b) despite its dependence on the size of the masses.

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- *Read the eBook*
- Section 3.3

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4. 2/2 points | Previous Answers MI3 3.2.X.027

At a particular instant the magnitude of the gravitational force exerted by a planet on one of its moons is 3×10^{23} N.

(a) If the mass of the moon were six times as large, what would the magnitude of the force be?

$|\vec{F}|$ = 18e23 ✓ N

(b) If instead the distance between the moon and the planet were six times as large (no change in mass), what would the magnitude of the force be?

$|\vec{F}|$ = 8.33e21 ✓ N

- *Read the eBook*
- Section 3.2

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5. 1/1 points | Previous Answers MI3 3.2.X.029

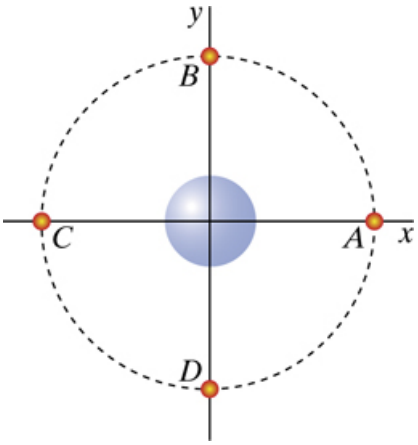
A planet exerts a gravitational force of magnitude 4e22 N on a star. If the planet were 5 times closer to the star (that is, if the distance between the star and the planet were 1/5 what is is now), what would be the magnitude of the force on the star due to the planet?

$|\vec{F}|$ = 1e24 ✓ N

- *Read the eBook*
- Section 3.2

6. 4/4 points | Previous Answers MI3 3.2.X.030

{A moon orbits a planet in the *xy* plane, as shown in the figure. You want to calculate the force on the moon by the planet at each location labeled by a letter (*A*,*B*,*C*,*D*). At each of these locations, what are **(a)** the unit vector $\hat{r}$, and **(b)** the unit vector $\hat{F}$ in the direction of the force?



At *A*:

$\hat{r}$ = ⟨ 1 ✓ , 0 ✓ , 0 ⟩

$\hat{F}$ = ⟨ -1 ✓ , 0 ✓ , 0 ⟩

At *B*:

$\hat{r}$ = ⟨ 0 ✓ , 1 ✓ , 0 ⟩

$\hat{F}$ = ⟨ 0 ✓ , -1 ✓ , 0 ⟩

At *C*:

$\hat{r}$ = ⟨ -1 ✓ , 0 ✓ , 0 ⟩

$\hat{F}$ = ⟨ 1 ✓ , 0 ✓ , 0 ⟩

At *D*:

$\hat{r}$ = ⟨ 0 ✓ , -1 ✓ , 0 ⟩

$\hat{F}$ = ⟨ 0 ✓ , 1 ✓ , 0 ⟩

- *Read the eBook*
- Section 3.2

7. 4/4 points | Previous Answers MI3 3.2.X.008

A planet of mass 8×10^{24} kg is at location < 4×10^{11}, -5×10^{11}, 0 > m. A star of mass 4×10^{30} kg is at location < -2×10^{11}, 4×10^{11}, 0 > m. It will be useful to draw a diagram of the situation, including the relevant vectors.

What is the relative position vector pointing from the planet to the star?

$\vec{r}$ = < -6e11 ✓ , 9e11 ✓ , 0 ✓ > m

What is the distance between the planet and the star?

$|\vec{r}|$ = 1.08e12 ✓ m

What is the unit vector $\hat{r}$ in the direction of $\vec{r}$?

$\hat{r}$ = < -0.56 ✓ , 0.83 ✓ , 0 ✓ >

What is the magnitude of the force exerted on the planet by the star?

$|\vec{F}_{\text{on planet}}|$ = 1.84e21 ✓ N

What is the magnitude of the force exerted on the star by the planet?

$|\vec{F}_{\text{on star}}|$ = 1.84e21 ✓ N

What is the force (vector) exerted on the planet by the star?

$\vec{F}_{\text{on planet}}$ = < -1.0304e21 ✓ , 1.5272e21 ✓ , 0 ✓ > N

What is the force (vector) exerted on the star by the planet?

$\vec{F}_{\text{on star}}$ = < 1.0304e21 ✓ , -1.5272e21 ✓ , 0 ✓ > N

- *Read the eBook*
- Section 3.2

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8. 4/4 points | Previous Answers MI3 3.2.X.034

A planet of mass 5×10^{24} kg is at location $\langle -4 \times 10^{11}, 6 \times 10^{11}, 0 \rangle$ m. A star of mass 7×10^{30} kg is at location $\langle 7 \times 10^{11}, -6 \times 10^{11}, 0 \rangle$ m. What is the force exerted on the planet by the star? (It will probably be helpful to draw a diagram, including the relevant vectors.)

$\vec{F}_{\text{on planet}}$ = ⟨ 5.96025e20 ✓ , -6.5e20 ✓ , 0 ⟩

- *Read the eBook*
- Section 3.2

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9. 2/2 points | Previous Answers MI3 3.3.X.037.alt01

If the mass of a planet is 4.80×10^{24} kg, and its radius is 2.70×10^{6} m, what is the magnitude of the gravitational field, *g*, on the planet's surface?

g = 44.12 ✓ N/kg

An object of mass 17 kg rests on the surface of this planet. What is the magnitude of the gravitational force on the object?

$|\vec{F}_{\text{grav}}|$ = 750.04 ✓ N

- *Read the eBook*
- Section 3.3