ISP209 Spring 2002 **Homework 2** Name: _____
Due: Thurs., Jan. 24, 2:40 pm, in Rm 118PA. ID:_____

Vectors: magnitude cannot be negative; sign (+/–) is the direction.

Homework Problems:

1. Which force, electromagnetic(E), gravitational(G), weak nuclear(WN) or strong nuclear(SN), is primarily responsible for the following:

charging a battery. __E__	hitting a baseball. _____
shaking of a earthquake. _____	skating on a frozen lake. ____ and _____
twinkling of star. _____	coloring of paints. _____
cauterizing an injury. _____	decay of dead plants. _____
dying of cloth. _____	singing a song. _____
tanning of leather. _____	beating of the heart. _____

2. There are no forces acting a spring. What word describes its length? _____ length.

3. With an open hand, you try to apply a force to only one end of an ideal spring (other end free). As it leaves your hand, is the spring moving? _____ Compressed? _____

4. Choose a magnitude and direction for two force vectors, $\mathbf{F}_1$ = _____, and $\mathbf{F}_2$ = _____, that can stretch a stationary spring.

5. What is the angle between the vectors $\mathbf{F}_1 = -F$ and $\mathbf{F}_2 = +F$?

6. Is there a value for C making vectors, $\mathbf{C} = -C$ and $\mathbf{T} = +T$, equal, Yes or No? State your reasons for this answer! _____

7. A physics quantity can be either a vector or a scalar. Is the sum of 5 vectors a *scalar* or a *vector*? _____

8. a) Given that $\mathbf{F} = -F$, and $\mathbf{T} = +T$, where $F = 2T$, What is $\mathbf{S} = \mathbf{F}+\mathbf{T}$ = _____.
b) A vector sum, $\mathbf{F} + \mathbf{T} = 0$, and $\mathbf{F} = -F$. Which is correct? $\mathbf{T} = +F$ or $\mathbf{T} = -F$.

9. What is the spring-like kid's toy that is definitely not an ideal spring? _____.

10. What name is given to the force a material generates when stretched? _____

11. What name is given to the force a material generates when squeezed? _____

12. Draw below two hands holding a stretched spring, showing the spring and the force vectors *acting on* it, and tension force vectors of the spring acting on the hands.

13. Acting on an object, can two force vectors cancel (have no effect at all)? _____

14. Two forces satisfy three conditions if they are going to balance. How many objects can they act on? _____. Are the two magnitudes equal or different? _____. Are the two directions the same or opposite? _____

15. Copy a statement of Newton's third law of motion from the text.

_____.

16. Normally, how many objects must be involved to find an action - reaction pair of forces? ___. On the objects, where does one find the action - reaction force pairs? _____.

17. Fixed to the ceiling, is a frictionless pulley wheel with a rope hanging over the wheel. The rope tension forces pulling on either side of the wheel must have equal magnitudes. True or False? _____.

18. Can two force vectors "balance" and be "equal" at the same time. ____ The reason for this is _____.

19. A spring is stretched by an amount x , by a force applied to both ends of a spring. What is the stretch of the spring if the force on it is doubled? _____ Does the force have to be doubled on both sides of the spring for this to happen? _____

Three identical springs are stretched and generate tension forces, *T*, that act on the left and right sides of a frame, as shown. The top and bottom of the frame (shaded) compress to balance the tension.

20. Compression force vectors, magnitude, *C*, are generated in the top and bottom. With a reasonable length and standard labels, draw both vectors on the figure.

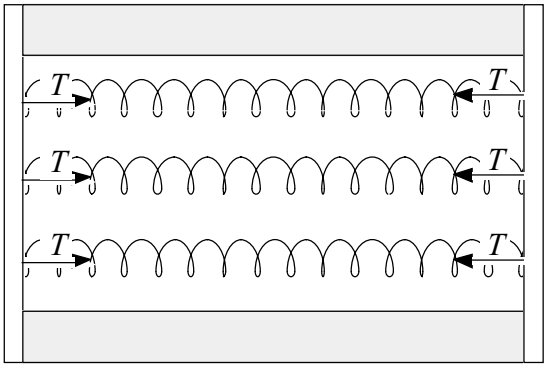

Figure for problems 20 and 21.

21. What is the relationship between the magnitudes of the compression force vectors, C , and the tension in the springs?

Four identical springs are stretched between two boards held apart by a bar (shaded) between them.

22. Forces with magnitude, *T*, are generated in the springs. With a reasonable length and standard labels, draw these vectors on the figure.

23. What is the relationship between the value of *C*, and the value of *T*, that is needed to balance the forces acting on the left or right board.

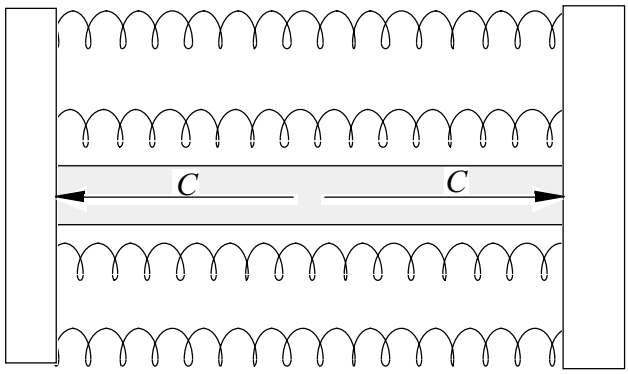

Figure for problems 22 and 23.

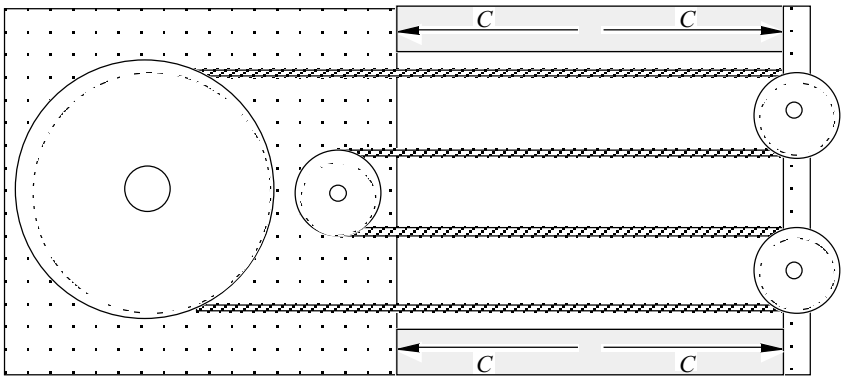

Figure for Problem 24 and 25

24. Three small pulleys and one large pulley are mounted on a frame. A belt with tension, *T*, runs over the pulleys causing compression forces, *C* , in the top and bottom of the frame as shown in the figure. With a reasonable length and standard labels, draw on the figure all tension vectors acting in each of the 4 sections of the belt.

25 From the balance condition on the right (or left) side of the frame, find the relationship between the tension *T* and the compression *C* .

If necessary, correct the lengths of the tension vectors on the figure to agree with this answer.