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**Lab No. (1)**

# The Universal Gravitational Law

## Newton' Law

### Questions:

**Q 1:** What is the force exerted by Big Ben on the Empire State building? Assume that Big Ben has a mass of  $10^8$  kilograms and the Empire State building  $10^9$  kilograms. The distance between them is about 5000 kilometers and Big Ben is due east of the Empire State building.

**Q 2 :** What is the gravitational force that the sun exerts on the earth? The earth on the sun? In what direction do these act? ( $M_e = 5.98 \times 10^{24}$  and  $M_s = 1.99 \times 10^{30}$  and the earth-sun distance is  $150 \times 10^9$  meters).

**Q 3 :** Determine the force of gravitational attraction between the earth ( $m = 5.98 \times 10^{24}$  kg) and a 70-kg physics student if the student is standing at sea level, a distance of  $6.38 \times 10^6$  m from earth's center.

**Q 4:** Determine the effect of the object masses and separation distance upon the amount of gravitational attraction using the data listed in the following table and discuss the results:

Mass of object 1 (kg)	Mass of object 2 (kg)	Separation distance (m)	Gravitation Force (N)
60	45	2	
100	90	6	
200	135	8	