

1. Particle 1 has a mass of $M_1 = 6$ kg, and particle 2 has a random mass of M_2 , following a normal distribution $N(10, 0.3^2)$ kg. If they are 0.9 m apart, what is the distribution of the force of gravity acting between them?

Solution

$$F = G \frac{m_1 m_2}{r^2}$$

where $G = 66.73(10^{-12}) \text{ m}^3/(\text{kg}\cdot\text{s}^2)$

$$\mu_F = 66.73(10^{-12}) \left[\frac{6(10)}{0.9^2} \right] = 4.94(10^{-9}) \text{ N} = 4.94 \text{ nN}$$

$$\sigma_F = 66.73(10^{-12}) \left[\frac{6(0.3)}{0.9^2} \right] = 0.15(10^{-9}) \text{ N} = 0.15 \text{ nN}$$

Thus, the distribution is $F \sim N(4.94, 0.15^2)$ nN.

Ans.