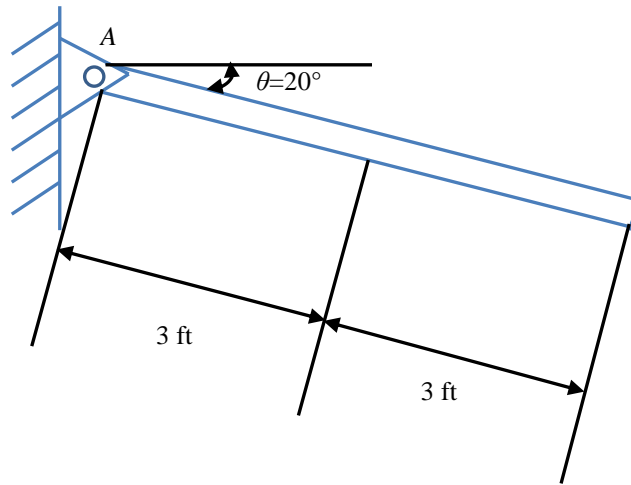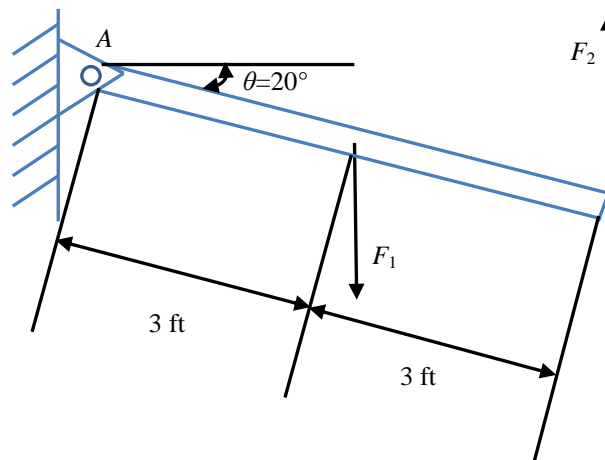23. The rod is subjected to two independently and normally distributed forces $F_1 \sim N(250, 5^2)$ lb and $F_2 \sim N(100, 2^2)$ lb and is pinned at A. Determine the distribution of the moment at A for equilibrium.

Solution

$$\sum M_A = 0; \quad W_A + F_1(3)\cos 20° - F_2(6)\cos 20° = 0$$

Thus, we can obtain

$$\mu_{W_A} = -\mu_{F_1}(3)\cos 20° + \mu_{F_2}(6)\cos 20° = -140.95 \text{ lb/ft}$$

$$\sigma_{W_A} = \sqrt{(\sigma_{F_1}(3)\cos 20°)^2 + (\sigma_{F_2}(6)\cos 20°)^2} = -18.05$$

Finally, we can obtain the distribution of moment at A is

$$W_A \sim N(-140.95, 18.05^2) \text{ lb/ft}$$

Ans.