Refer to the sketch showing the upper body free body diagram of forces when a person of mass \( W = 100 \text{ kg} \) is standing on his left leg. \( W_2 \) is the weight of the whole body (W) minus the weight of the right leg \( W_1 \) acting through G.

(1) Assume CG of the right leg is acting through a point 15 cm horizontally away from the body mid-line, and \( W_1 = 0.17 \text{ W} \), find the horizontal shift \( x \) of \( W_2 \)'s line of action (CG) from the body mid-line.

(2) Assume that the person is maintaining the same posture and now is using a cane in his left hand to support himself. The cane is placed at a horizontal distance of 30 cm from his body mid-line in his left hand. If the cane supports 10 percent of his total body weight, what would be the new position of G, the value of \( x \) and the value of \( W_2 \)? Neglect the weight of the cane.

(3) Repeat the problem 2, with same parameters for everything except now the cane is in his right hand.

(4) Given that the horizontal distances between the muscle attachment point D and body midline is 25 cm, and hip joint rotational axis (E) and the body mid-line is 16 cm, and the vertical distance between point D and E is 10 cm, direction of \( F_M \) with the vertical is 10° clockwise, find for each of the cases 1, 2 and 3, the magnitude of the muscle force \( F_M \), and both magnitude and direction of \( F_J \)

Homework #2, Due on Feb 16

Solve textbook problems:
4.2, 4.3, 4.5, 4.6