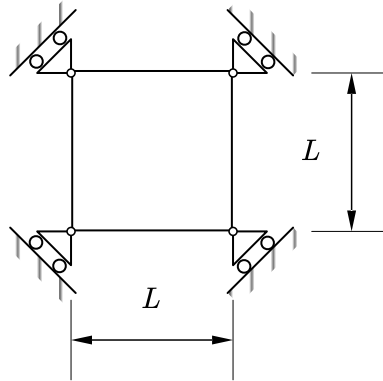## Homework #1 Solution

Problem 1: Classify each of the structures as statically determinate, statically indeterminate, stable, or unstable. If indeterminate, specify the degree of indeterminacy.
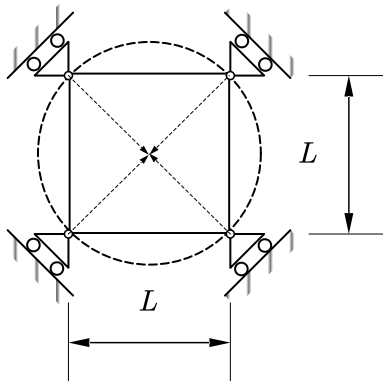

(a)

m (members)=4, r (reactions)=4, j (joints) =4
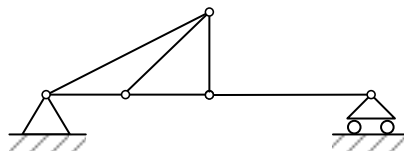
m+r=2j=8 ===> statically determinate

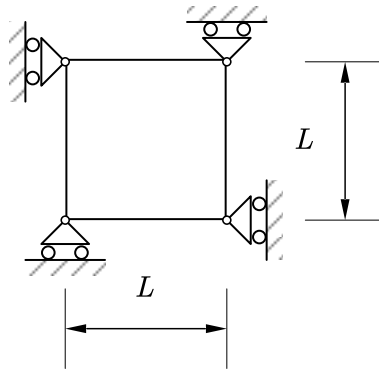However, the reaction forces are concurrent at a point, so the structure is unstable (a movement can develop).

(b)

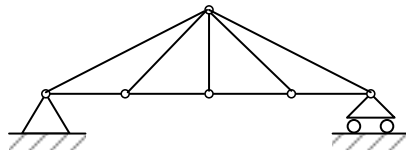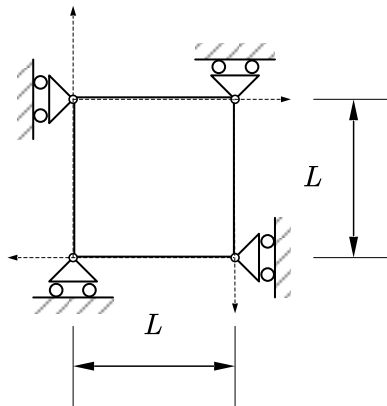m (members)=6, r (reactions)=3, j (joints) =5

m+r=9<2j=10 ===> unstable

(c)

m (members)=4, r (reactions)=4, j (joints) =4

m+r=2j=8 ===> statically determinate

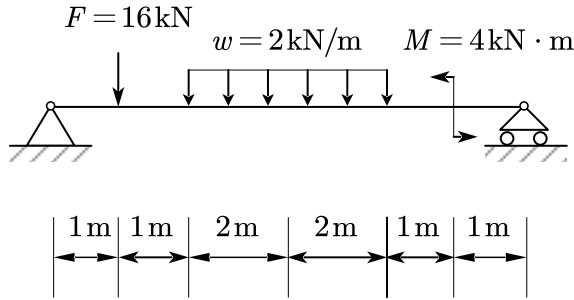Because the reactions are not concurrent at a point, the structure is stable.

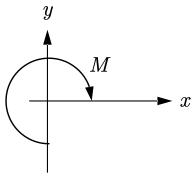(d)

m (members)=9, r (reactions)=3, j (joints) =6

m+r=2j=12 ===> statically determinate also stable

Problem 2: Solver for the reactions for the following structures. Shear force and bending moment diagram are also required to present.
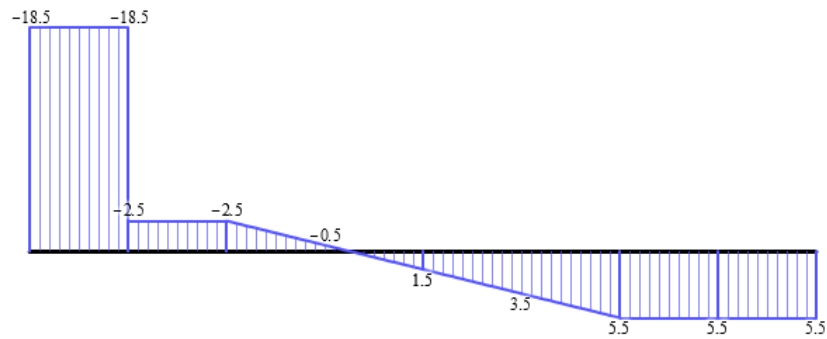
$$F = 16\,\text{kN}$$
$$w = 2\,\text{kN/m} \qquad M = 4\,\text{kN} \cdot \text{m}$$

| 1 m | 1 m | 2 m | 2 m | 1 m | 1 m |

(a)

Positive direction for shear force and moment:

y

M

x

However, when you draw diagrams, the sign can be neglected.
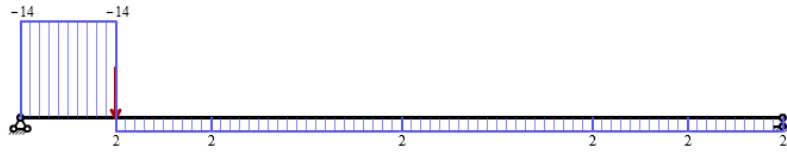
Shear Force Diagram (SFD):

−18.5   −18.5

−2.5   −2.5

−0.5

1.5

3.5

5.5   5.5   5.5

Moment Diagram (MD):
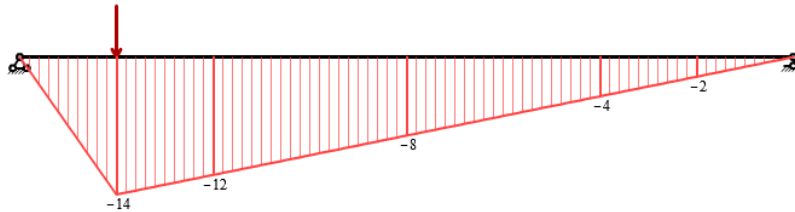
−5.5

−9.5
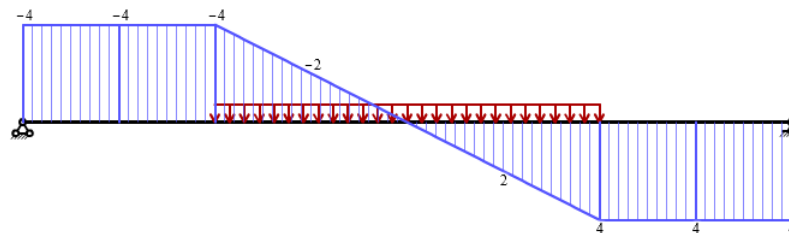
−15

−18.5
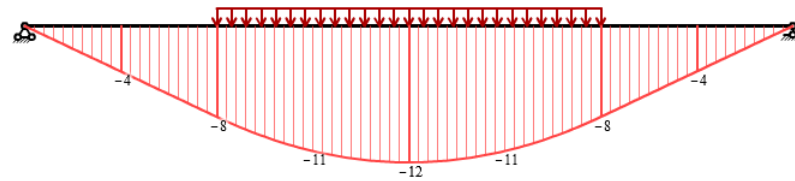
−19.5

−21

−22.5   −22
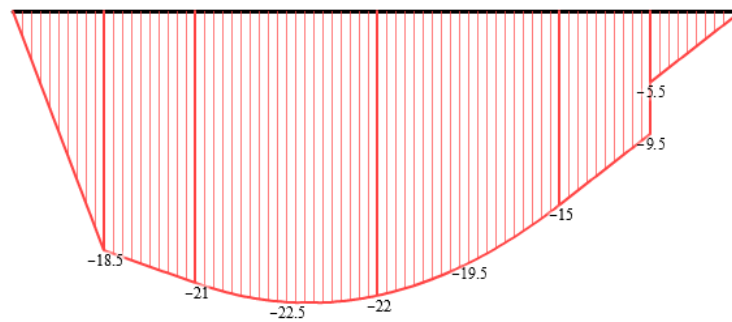
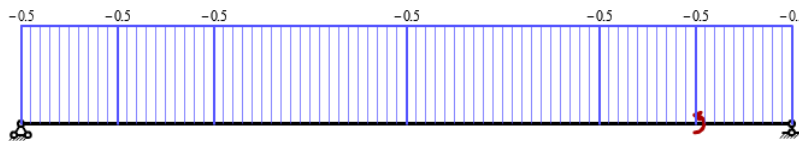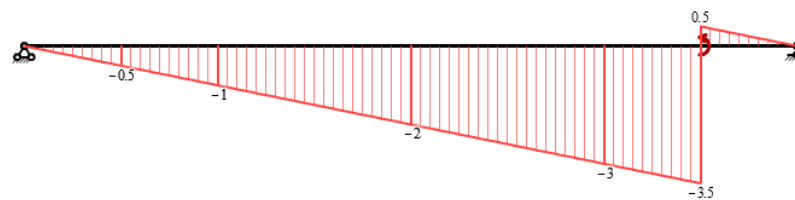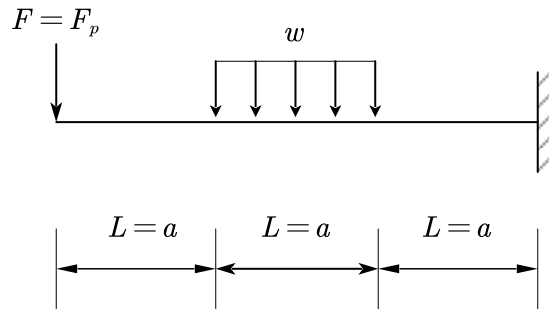Note: if using method of superposition (summation of (1) to (3)):

(1)SFD:

MD:

(2) SFD:

MD:

(3) SFD:

MD:

$F = F_p$

w

$L = a$ $L = a$ $L = a$

(b)

SFD:

F_P F_P

$F_P + wL$ $F_P + wL$

MD:

$$3F_p L + \frac{3wL^2}{2}$$

$$2F_p L + \frac{wL^2}{2}$$

$F_p L$
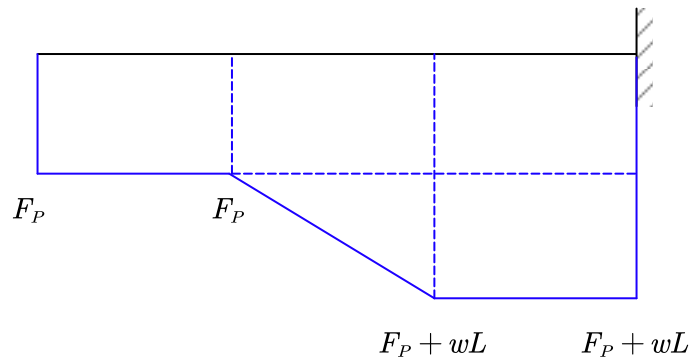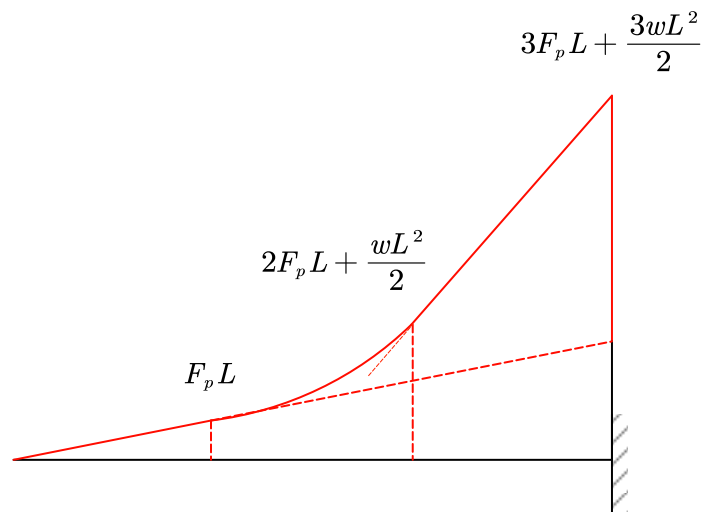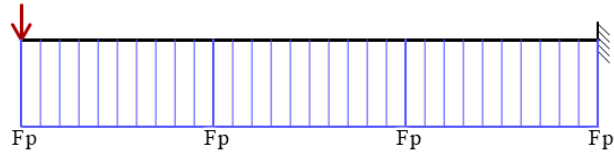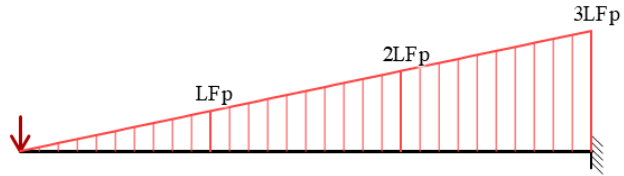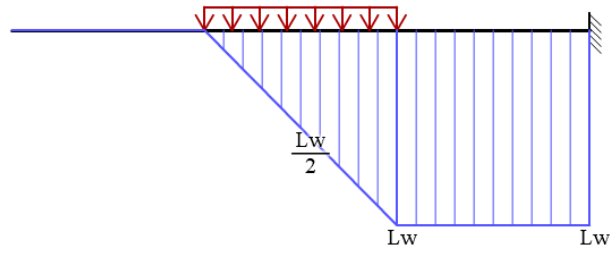
Note: if using method of superposition (summation of (1) and (2))

(1) SFD:

MD:

(2) SFD:

MD: