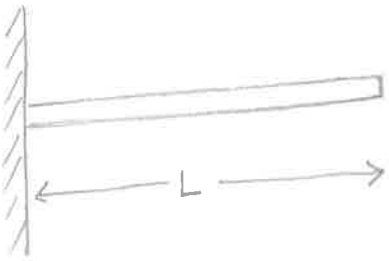
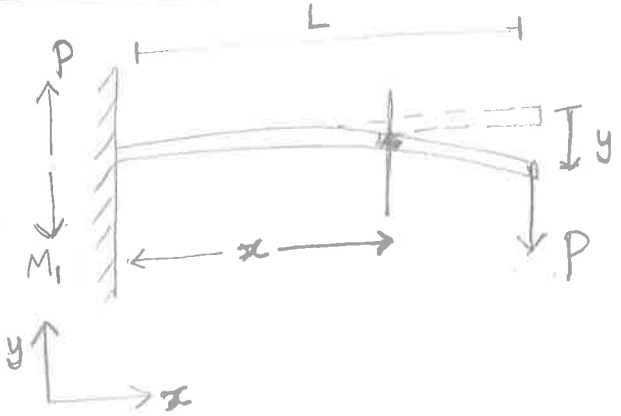
Assignment - 7 Hints to solution

1)





If load P is at the free end, then force P will come in to play at fixed end.

Since fixed end does not move, moment about x, equal to P.x is cancelled by M_1 (equal to $-Px$).

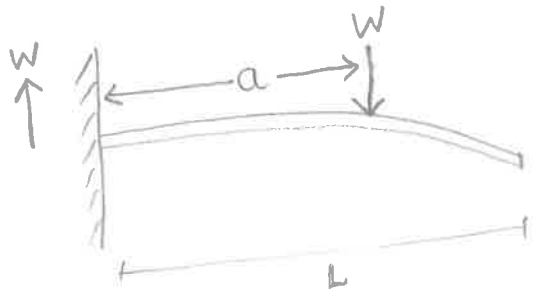
Hence, bending moment $M = W(L-x) + Px - Px$

$= W(L-x)$.

Then use $EI\,y'' = M$ to solve for $y(x)$ using boundary conditions $y=0$ at $x=0$ and $y'=0$ at $x=0$.

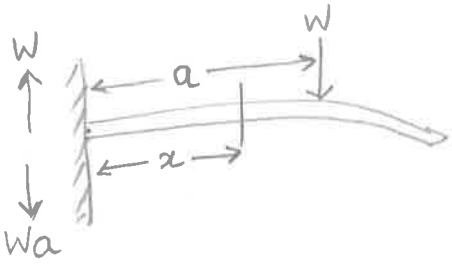
2, 3) Problems were done in class.

4)



Consider two cases $x < a$ and $x > a$

case $x < a$

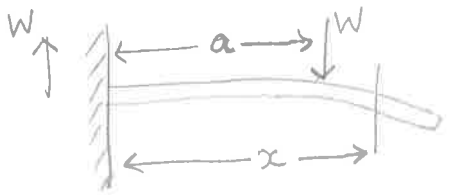


Bending moment

$M = W(a-x)$

(This case is same as problem 1). Boundary conditions At $x=0$, $y=0$ and $y'=0$.

case $x > a$



Bending moment : $M = Wx - Wa - W(x-a) = 0$

For $x > a$, bending moment is 0.

If $y_1(x)$ and $y_2(x)$ are solutions for $x < a$ and $x > a$ cases respectively, then $y_1' = y_2'$ at $x = a$.

5) In this case too, consider two possibilities;

$x < a$ and $x > a$.

Otherwise, this problem is similar to problem 4.

Boundary conditions are at $x = 0$, $y = 0$ and $x = a+b$, $y' = 0$.

Answers;

1) $\delta_{max} = \frac{PL^3}{48EI}$

4) $\delta_{max} = -\frac{1}{6} Pa^2 (3L - a)$

5) $\delta_{max} = \frac{5 w_0 L^4}{384 EI}$