Ben Ridenbaugh HW9

8-28. $y(x)=\frac{-P}{128EI}(7L^2x-16x^3)$

a. $y'(x)=\theta(x)=\frac{-P}{128EI}(7L^2-48x^2)$

b. $\theta(x)=0$ when...

$$7L^2-48x^2=0$$
$$x=\pm\sqrt{\frac{7}{48}L^2}$$

c. $y(0)=0$

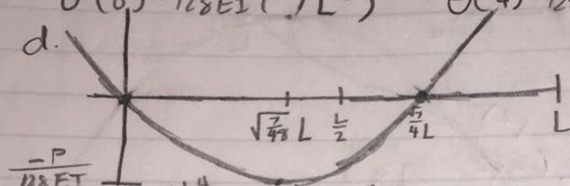
$\theta(0)=\frac{-P}{128EI}(7L^2)$

$y(\frac{L}{4})=\frac{-P}{128EI}(\frac{7}{4}L^3-\frac{1}{4}L^3)=\frac{-P}{128EI}(\frac{3}{2}L^3)$

$\theta(\frac{L}{4})=\frac{-P}{128EI}(7L^2-3L^2)=\frac{-P}{128EI}(4L^2)$

$y(x)=0$ when $x=0, \sqrt{\frac{7}{16}L^2}$

d.



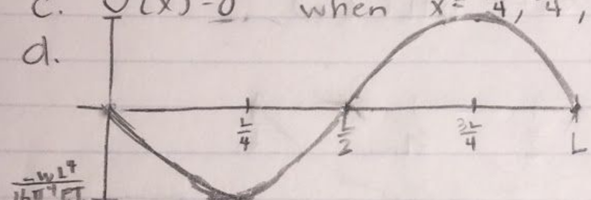
8-30. $y(x)=\frac{-wL^4}{16\pi^4EI}\sin(\frac{2\pi}{L}x)$

a. $y'(x)=\theta(x)=\frac{-2wL^3}{16\pi^3EI}\cos(\frac{2\pi}{L}x)$

b. $y(x)=0$ when $x=0, \frac{L}{2}, L, \frac{3L}{2}, \ldots$

c. $\theta(x)=0$ when $x=\frac{L}{4}, \frac{3L}{4}, \frac{5L}{4}, \ldots$

d.



Flipped because of negative constant

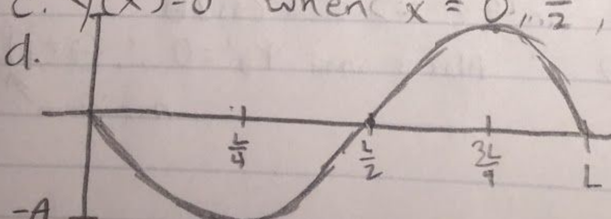
8-33. $y(x)=-A\sin(\frac{2\pi}{L}x)$

a. $y'(x)=\theta(x)=-A(\frac{2\pi}{L})\cos(\frac{2\pi}{L}x)$

b. $\theta(x)=0$ when $x=\frac{L}{4}, \frac{3L}{4}, \frac{5L}{4}, \ldots$

c. $y(x)=0$ when $x=0, \frac{L}{2}, L, \frac{3L}{2}, \ldots$

d.



8-35. $y(x) = \frac{-w}{48EI}(2x^4 - 5x^3L + 3x^2L^2)$

a. $y'(x) = \theta(x) = \frac{-w}{48EI}(8x^3 - 15x^2L + 6xL^2)$

$x(8x^2 - 15xL + 6L^2) = 0$

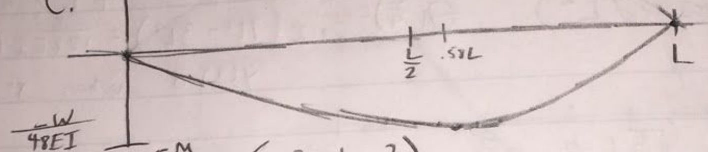
$\frac{15L \pm \sqrt{(-15L)^2 - 4(8)(6L^2)}}{2(8)}$

$\frac{15L \pm \sqrt{33L^2}}{16}$

$\therefore x = 0, .58L, 1.3L$

b. $\theta(0) = 0$ $\quad \theta(L) = \frac{-w}{48EI}(2L^4 - 5L^4 + 3L^4) = 0$

c.



8-36. $y(x) = \frac{-M}{4EIL}(x^3 - Lx^2)$

a. $y'(x) = \theta(x) = \frac{-M}{4EIL}(3x^2 - 2Lx)$

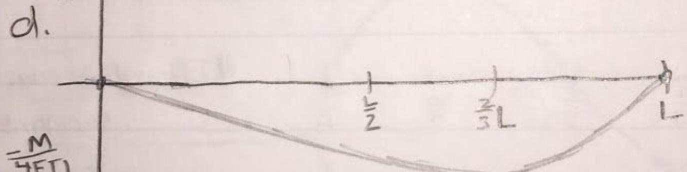
b. $\theta(x) = \frac{-M}{4EIL}(3x^2 - 2Lx) = 0$

$\therefore x = 0, \frac{2}{3}L$

c. $y(0) = 0$ $\quad y(L) = 0$

$\theta(0) = 0$ $\quad \theta(L) = \frac{-M}{4EIL}(L^2)$

d.



8.37. $\sigma_\theta = \frac{32T}{\pi d^3}\sin\theta\cos\theta$

$\tau_\theta = \frac{16T}{\pi d^3}(\cos^2\theta - \sin^2\theta)$

$\boxed{2\sin\theta\cos\theta = \sin 2\theta \quad \cos^2\theta - \sin^2\theta = \cos 2\theta}$

a. $\sigma_\theta = \frac{32T}{\pi d^3}\sin\theta\cos\theta \Rightarrow \frac{16T}{\pi d^3}\sin 2\theta$

$\sigma_\theta' = \frac{32T}{\pi d^3}\cos 2\theta$ $\quad$ Max is when $\sigma_\theta' = 0 \therefore \theta = \frac{\pi}{4}$

b. $\tau_\theta = \frac{16T}{\pi d^3}(\cos^2\theta - \sin^2\theta) \Rightarrow \frac{16T}{\pi d^3}\cos 2\theta$

$\tau_\theta' = \frac{-32T}{\pi d^3}\sin 2\theta$ $\quad$ Max is when $\tau_\theta' = 0 \therefore \theta = \cancel{0}, \frac{\pi}{2}$

minimum