8. (cont.)

$y' = \cos x + \frac{1}{2}\cos(2x)$

$y'' = -\sin x + \frac{1}{2}\left(-\sin(2x)\cdot \frac{d}{dx}(2x)\right)$

$= -\sin x - \frac{1}{2}\cdot 2\sin(2x)$

$= \boxed{-\sin x - \sin(2x)}$

$0 = -\sin x - \sin(2x)$

$0 = \sin x + \sin(2x)$

$0 = \sin x + 2\sin x\cos x$

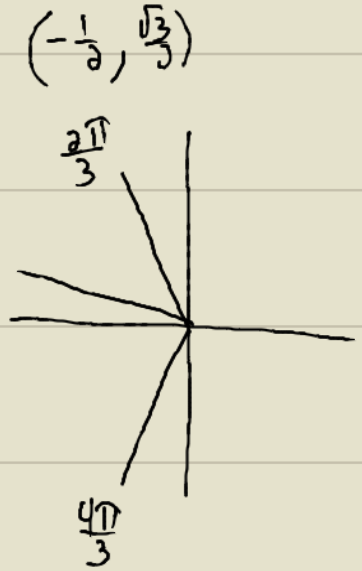
$0 = \sin x(1 + 2\cos x)$

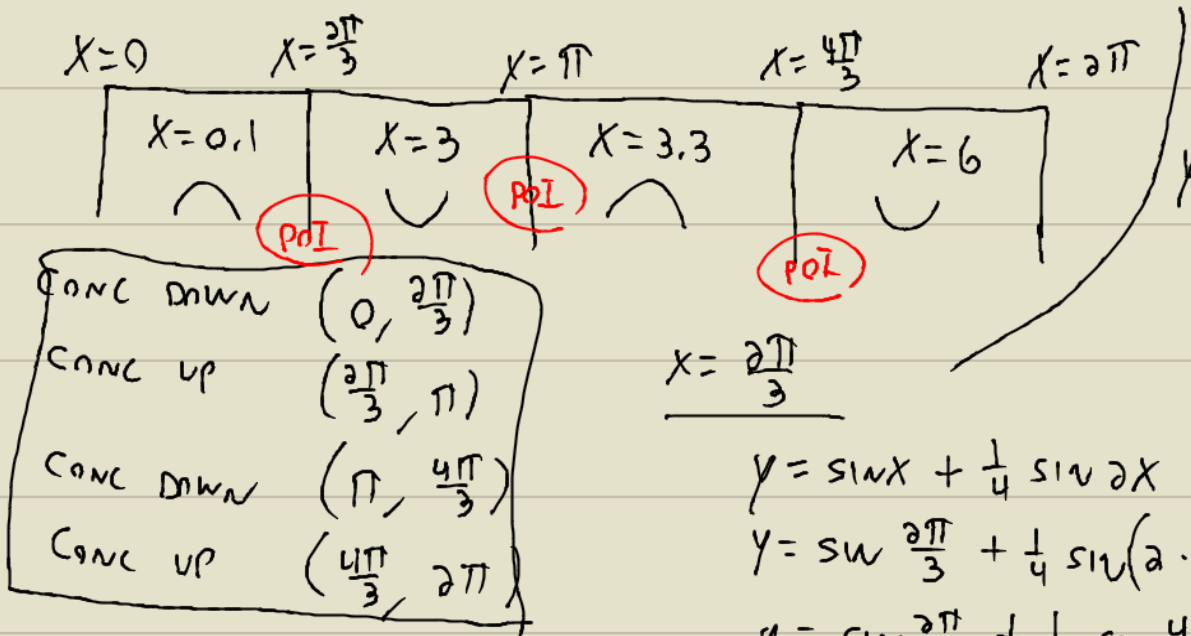
$\sin x = 0 \qquad 1 + 2\cos x = 0$

$x = 0, \pi, 2\pi \qquad 2\cos x = -1$

$\cos x = -\frac{1}{2}$

$x = \frac{2\pi}{3}, \frac{4\pi}{3}$





Conc down $\left(0, \frac{2\pi}{3}\right)$

Conc up $\left(\frac{2\pi}{3}, \pi\right)$

Conc down $\left(\pi, \frac{4\pi}{3}\right)$

Conc up $\left(\frac{4\pi}{3}, 2\pi\right)$

$x = \pi$

$y = \sin\pi + \frac{1}{4}\sin(2\cdot\pi)$

$y = 0 + \frac{1}{4}(0)$

$y = 0$

POI $(\pi, 0)$

$x = \frac{2\pi}{3}$

$y = \sin x + \frac{1}{4}\sin 2x$

$y = \sin\frac{2\pi}{3} + \frac{1}{4}\sin\left(2\cdot\frac{2\pi}{3}\right)$

$y = \sin\frac{2\pi}{3} + \frac{1}{4}\sin\frac{4\pi}{3}$

$y = \frac{\sqrt{3}}{2} + \frac{1}{4}\cdot\left(-\frac{\sqrt{3}}{2}\right)$

$= \frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{8} = \frac{4\sqrt{3}}{8} - \frac{\sqrt{3}}{8} = \frac{3\sqrt{3}}{8}$

POI: $\left(\frac{2\pi}{3}, \frac{3\sqrt{3}}{8}\right)$

$x = \frac{4\pi}{3}$

$y = \sin\frac{4\pi}{3} + \frac{1}{4}\sin\frac{8\pi}{3}$

$= -\frac{\sqrt{3}}{2} + \frac{1}{4}\cdot\frac{\sqrt{3}}{2}$

$= -\frac{4\sqrt{3}}{8} + \frac{\sqrt{3}}{8}$

$= \frac{-3\sqrt{3}}{8}$

POI: $\left(\frac{4\pi}{3}, \frac{-3\sqrt{3}}{8}\right)$