$16\sin^2 x - 8\sin x$ from Tuesday,

$-8\sin^2 x - 16\sin x + 8 = f(x)$

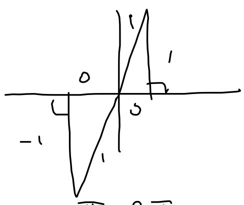
zeros of f on $[0, 2\pi)$ are $\boxed{x \approx 204.4698005,\ 335.5301995}$

Not asked

$f'(x) = -2\sin x\cos x - 16\cos x$

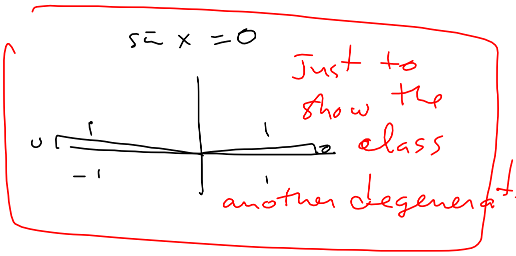
$= -2\cos x\,[\sin x + 8] \overset{\text{SET}}{=} 0$

$\Rightarrow \cos x = 0$



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

$\sin x = 0$

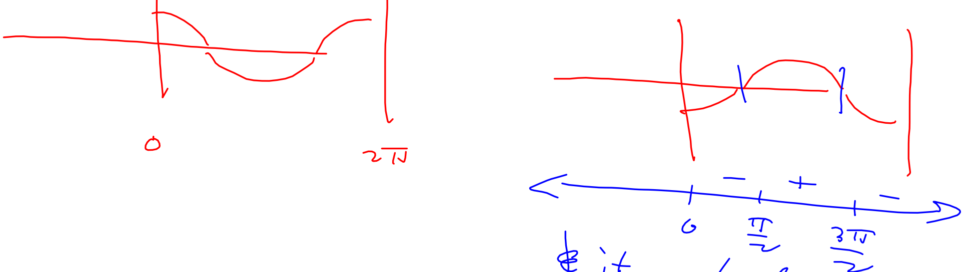


Just to show the class another degenerate

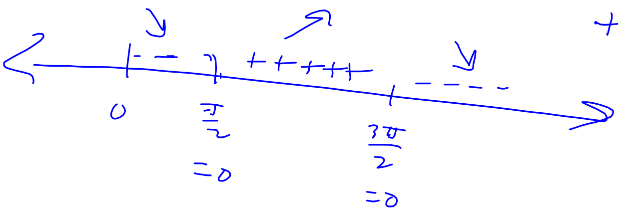
$-2\cos x \boxed{[\sin x + 8]}$ +

Analyze the sign :

$f'(x) = -2\sin x\cos x - 16\cos x$ $-2\cos x$



& it controls the sign of $f'(x)$ so



f'

$f'(x) = -2\sin x\cos x - 16\cos x$

$f''(x) = -2\cos^2 x + 2\sin^2 x + 16\sin x \overset{\text{SET}}{=} 0$

$\left(-2[1-\sin^2 x] = -2 + \sin^2 x \right)$

$\Rightarrow \sin^2 x + 2\sin^2 x + 16\sin x - 2 =$

$3\sin^2 x + 16\sin x - 2 = 0$

$a = 3, b = 16, c = -2$

$b^2 - 4ac = 16^2 - 4(3)(-2)$

$= 256 + 24 = 280$

2 | 280
2 | 140
2 | 70
5 | 35
7

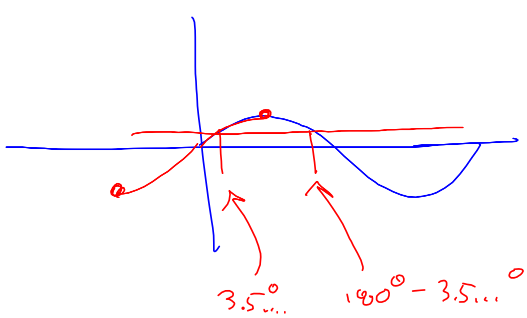
$x = \frac{-16 \pm 2\sqrt{70}}{2(3)} = \frac{-8 \pm \sqrt{70}}{6}$

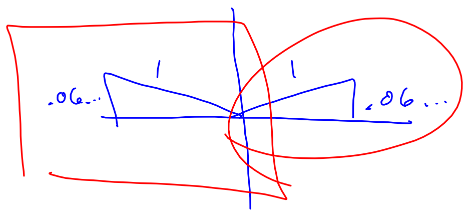
$\sin x = \frac{-8+\sqrt{70}}{6}$ OR $\sin x = \frac{-8-\sqrt{70}}{6}$

$\approx$ 0.061100045

$\boxed{\not\approx \text{-2.727766711 Impossible}}$

$\arcsin(.0611\ldots) \approx$ 3.502956564



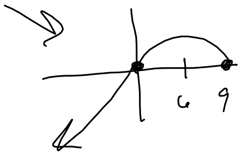


§3.3 video #5 (Lost the notes?)

$f(x) = x\sqrt{9-x} = x\sqrt{-(x-9)}$ ① $x \mapsto -x$ ② $x \mapsto x+9$

$= x\sqrt{-x+9}$ $x \mapsto x-9$

$x \mapsto -x$



$\mathcal{D}$: Need $9-x \geq 0$

$9 \geq x$

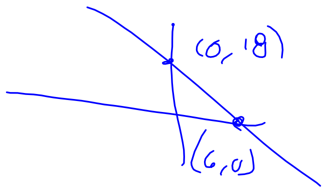
$\mathcal{D} = \{x \mid x \leq 9\} = (-\infty, 9]$

$f(x) = x(9-x)^{\frac{1}{2}} \Longrightarrow$

$f'(x) = (9-x)^{\frac{1}{2}} + x\left(\frac{1}{2}(9-x)^{-\frac{1}{2}}(-1)\right)$

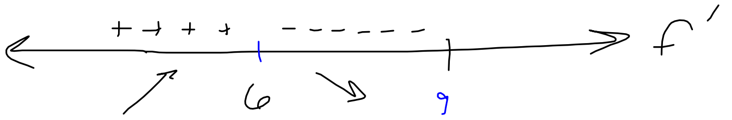
$= \frac{\sqrt{9-x}}{1} \cdot \frac{2\sqrt{9-x}}{2\sqrt{9-x}} - \frac{x}{2\sqrt{9-x}} = \frac{2(9-x) - x}{2\sqrt{9-x}} = \frac{18-2x-x}{2\sqrt{9-x}}$

$= \frac{18-3x}{2\sqrt{9-x}}$ $\mathcal{D}(f') = (-\infty, 9)$



$f' = 0 \Longrightarrow x = 6$

$f' \nexists \Longrightarrow x = 9$



ⓐ inc: $(-\infty, 6)$

dec: $(6, 9)$

ⓑ Local min NONE

where what

Local max $(6, f(6)) \to \boxed{(6, 6\sqrt{3}) \text{ is Max}}$

scratch $f(6) = 6\sqrt{9-6} = 6\sqrt{3}$

ⓒ $f'(x) = (9-x)^{\frac{1}{2}} + x\left(\frac{1}{2}(9-x)^{-\frac{1}{2}}(-1)\right)$

$= (9-x)^{\frac{1}{2}} - \frac{1}{2}x\,(9-x)^{-\frac{1}{2}} \implies$

$f''(x) = \underline{\frac{1}{2}(9-x)^{-\frac{1}{2}}(-1) - \frac{1}{2}(9-x)^{-\frac{1}{2}}} + \frac{1}{4}x\,(9-x)^{-\frac{3}{2}}(-1)$

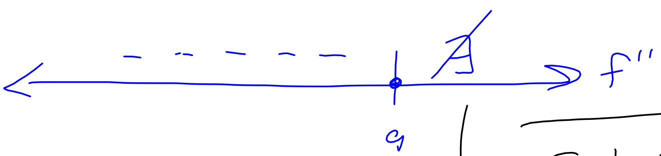
$-(9-x)^{-\frac{1}{2}} - \frac{1}{4}\cdot\frac{x}{(9-x)^{3/2}}$

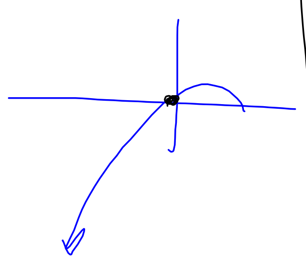
$-\frac{1}{(9-x)^{\frac{1}{2}}}\cdot\frac{36-4x}{4(9-x)^{1}} - \frac{1}{4}\cdot\frac{x}{(9-x)^{3/2}}$

$\frac{4x-36-x}{4(9-x)^{3/2}} = \frac{3(x-12)}{4(9-x)^{3/2}}$ $\overset{\text{SET}}{=} 0 \implies x = 12 \notin \mathcal{D}(f)$

$\to \frac{3x-36}{\text{stuff}}$

$f'' \nexists$ @ $x = 9$





I don't see an inflection point!

Concave Down on $(-\infty, 9)$