5.5 warmup

$\sqrt{ab} = \sqrt{a}\sqrt{b}$

$$\int \frac{\sin\sqrt{\theta}}{\sqrt{\theta\cos^3\sqrt{\theta}}}\,d\theta = \frac{\sin\sqrt{\theta}}{\sqrt{\theta}\sqrt{\cos^3\sqrt{\theta}}}$$

$u = \sqrt{\theta} = \theta^{\frac{1}{2}}$

$du = \frac{1}{2}\theta^{-\frac{1}{2}}d\theta = \frac{1}{2\sqrt{\theta}}d\theta$

$d\theta = 2\sqrt{\theta}\,du$

More ideal

$u = \cos\sqrt{\theta}$

$du = -\sin\sqrt{\theta}\cdot\frac{1}{2}\theta^{-\frac{1}{2}}$

$= \frac{-\sin\sqrt{\theta}}{2\sqrt{\theta}}$

$$\int \frac{\sin u}{\sqrt{\theta}\sqrt{\cos^3 u}}\cdot 2\sqrt{\theta}\,du$$

$$= 2\int \frac{\sin u}{\sqrt{\cos^3 u}}\,du = 2\int \frac{\sin u}{(\cos u)^{3/2}}\,du$$

$v = \cos^3 u$

$dv = 3\cos^2 u\cdot(-\sin u)\,du$

$$v = \cos u$$
$$dv = -\sin u \, du \Longrightarrow du = \frac{dv}{-\sin u}$$

$$2\int \frac{\sin u}{(\cos u)^{3/2}} \frac{dv}{-\sin u} =$$

$$= -2\int \frac{dv}{v^{3/2}} = -2\int v^{-3/2}\,dv = \frac{-2v^{-\frac{1}{2}}}{-\frac{1}{2}} + C$$

$$= 4(\cos u)^{-\frac{1}{2}} + C$$

$$= 4(\cos\sqrt{\theta})^{-\frac{1}{2}} + C$$

$$= \frac{4}{\sqrt{\cos\sqrt{\theta}}} + C$$

$$\frac{d}{d\theta}\left[4\left(\cos\left(\theta^{\frac{1}{2}}\right)\right)^{-\frac{1}{2}} + C\right]$$

$$= 4\left(+\tfrac{1}{2}\right)\left(\cos\left(\theta^{\frac{1}{2}}\right)\right)^{-\frac{3}{2}}\left(+\sin\left(\theta^{\frac{1}{2}}\right)\right)\left(\tfrac{1}{2}\theta^{-\frac{1}{2}}\right)$$

$$= \frac{\sin\sqrt{\theta}}{\theta^{1/2}(\cos\sqrt{\theta})^{3/2}}$$

$$= \frac{\sin\sqrt{\theta}}{\sqrt{\theta}\sqrt{\cos^3\sqrt{\theta}}} = \frac{\sin\sqrt{\theta}}{\sqrt{\theta\cos^3\sqrt{\theta}}}$$

$$\int \frac{\sin\sqrt{\theta}}{\sqrt{\theta}\cos^3\sqrt{\theta}}\,d\theta = \int \frac{\sin\sqrt{\theta}}{\sqrt{\theta}\,(\cos\sqrt{\theta})^{\frac{3}{2}}}\,d\theta$$

$$u = \cos\sqrt{\theta} = \cos(\theta^{\frac{1}{2}})$$

$$du = -\sin(\theta^{\frac{1}{2}}) \cdot \frac{1}{2}\theta^{-\frac{1}{2}}\,d\theta$$

$$du = \frac{-\sin\sqrt{\theta}}{2\sqrt{\theta}}\,d\theta \longrightarrow$$

$$-\frac{1}{3} = \frac{-1}{3} = \frac{1}{-3}$$

$$d\theta = \frac{2\sqrt{\theta}}{-\sin\sqrt{\theta}}\,du$$

$$\int \frac{\sin\sqrt{\theta}}{\sqrt{\theta}\,(\cos\sqrt{\theta})^{3/2}} \cdot \frac{-2\sqrt{\theta}}{\sin\sqrt{\theta}}\,du$$

$$\frac{2}{\frac{1}{2}} = 2 \cdot \frac{2}{1}$$

$$= \int \frac{-2}{(\cos\sqrt{\theta})^{3/2}}\,du = \int \frac{-2}{u^{3/2}}\,du$$

$$= \int -2u^{-3/2}\,du = -2\,\frac{u^{-\frac{1}{2}}}{-\frac{1}{2}} + C = 4u^{-\frac{1}{2}} + C$$

$$= 4(\cos\sqrt{\theta})^{-\frac{1}{2}} + C$$

$$= \frac{4}{\cos\sqrt{\theta}} + C$$

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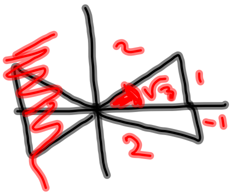
§4.4 #20

§4.4 #26 $f(x) = \frac{4}{3}x - \tan x$ $\left(\frac{\sin x}{\cos x}\right)$ $-\frac{\pi}{2} < x < \frac{\pi}{2}$

x-int:

$$f'(x) = \frac{4}{3} - \sec^2 x = \frac{4}{3} - \frac{1}{\cos^2 x}$$

$$= \frac{4\cos^2 x - 3}{3\cos^2 x} \quad \text{SET } 0$$

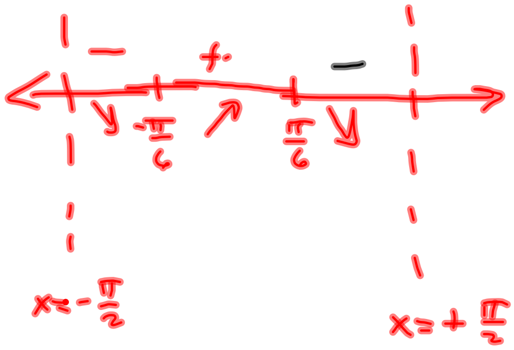


$$4\cos^2 x = 3$$

$$\cos^2 x = \frac{3}{4}$$

$$\cos x = \pm\frac{\sqrt{3}}{2}$$

$$x = \pm\frac{\pi}{6}$$



$f'(\frac{\pi}{3})$ for test: $\frac{4(\frac{1}{2})^2 - 3}{3\cos^2(\frac{\pi}{3})} = \frac{1-3}{+} = \frac{-}{+}$

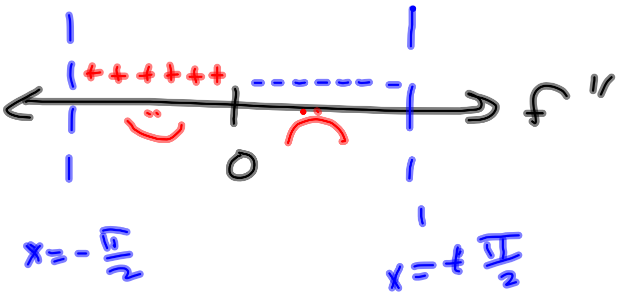
$$f''(x) = -2\sec x\,(\sec x \tan x)$$

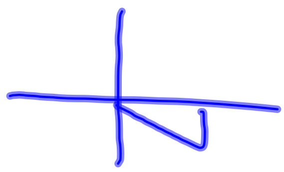
$$= -2\sec^2 x \tan x$$

$$= \frac{-2\sin x}{\cos^3 x} \quad \text{SET } 0$$

$x = 0$, $\pm\pi$, $\pm 2\pi$

The others aren't in $(-\frac{\pi}{2}, \frac{\pi}{2})$





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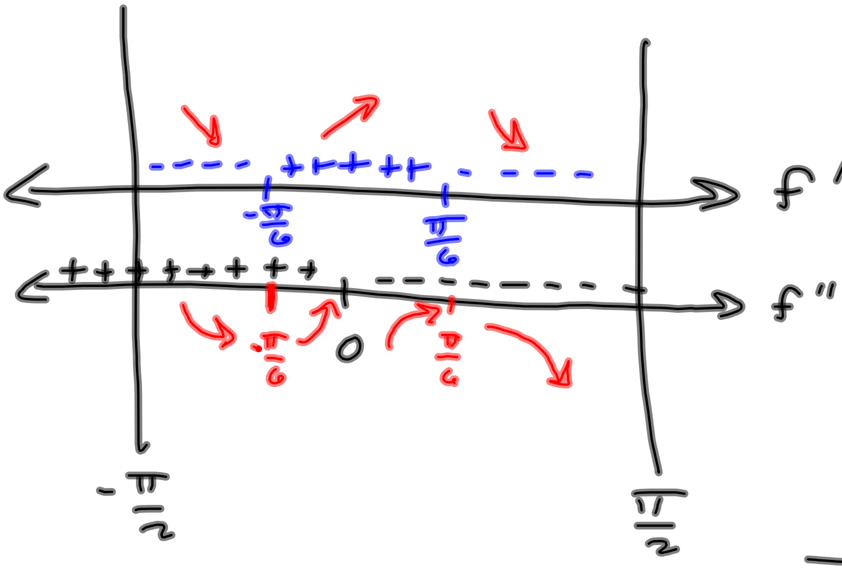
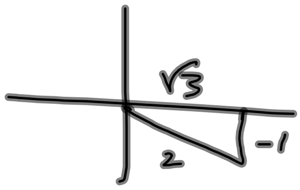




$f(0) = \frac{4}{3}(0) - \tan(0) = 0$

$f(-\frac{\pi}{6}) = \frac{4}{3}(-\frac{\pi}{6}) - \tan(-\frac{\pi}{6})$

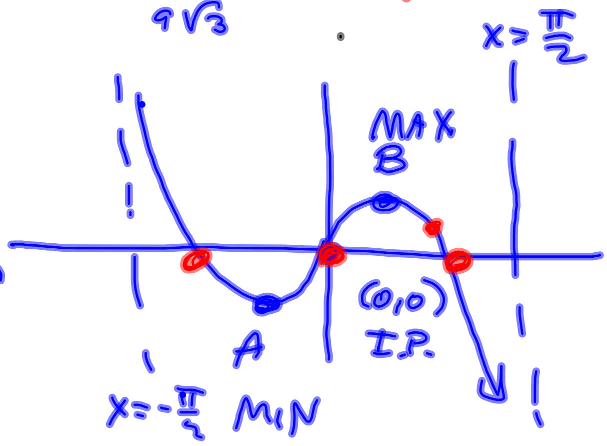
$= \frac{-2\pi}{9} - (-\frac{1}{\sqrt{3}}) \approx \frac{-2\sqrt{3}\pi + 9}{9\sqrt{3}}$ −

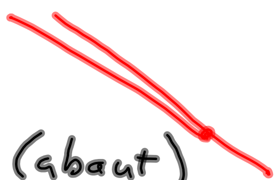
$-f(-\frac{\pi}{6}) = f(\frac{\pi}{6}) = \frac{2\sqrt{3}\pi - 9}{9\sqrt{3}}$ is +

$A = (-\frac{\pi}{6}, f(-\frac{\pi}{6}))$

$B = (\frac{\pi}{6}, f(\frac{\pi}{6}))$

Newton's Didn't help. Concave-down messed with me.





Grapher says ± .84473 (about)

#20 next time.