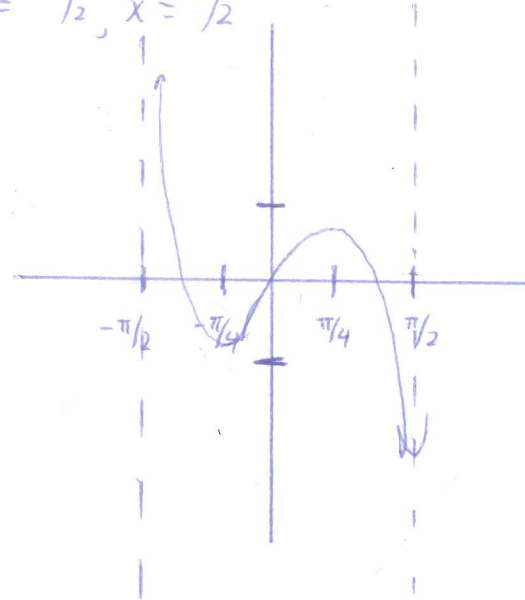


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Given Domain: $-\pi/2 < x < \pi/2$

41) $y = 2x - \tan x$

→ V.A. $x = -\pi/2, x = \pi/2$

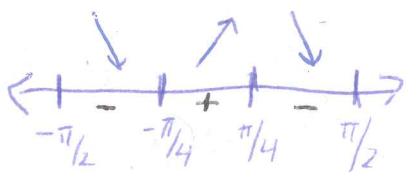


$y' = 2 - \sec^2 x$

$0 = 2 - \sec^2 x = 2 - \frac{1}{\cos^2 x}$

$2 = \sec^2 x$

$\sqrt{\frac{1}{2}} = \sqrt{\cos^2 x} \quad \cos x = \pm \frac{\sqrt{2}}{2} \quad x = -\pi/4, \pi/4$



$y'(-\pi/4) = 2 - \frac{1}{\cos^2(-\pi/4)}$
 $= 2 - \frac{1}{(\frac{1}{2})^2}$
 $= 2 - 4 = -2$

Dec: $(-\pi/2, -\pi/4) \cup (\pi/4, \pi/2)$ b/c $f'(x) < 0$

Inc: $(-\pi/4, \pi/4)$ b/c $f'(x) > 0$

Max $(\pi/4, \pi/2 - 1)$ b/c $f'(x)$ changes from + to -

Min $(-\pi/4, -\pi/2 + 1)$ b/c $f'(x)$ changes from - to +

$f(\pi/4) = 2(\pi/4) - \tan(\pi/4)$

$f(\pi/4) = \frac{\pi}{2} - 1 \approx 0.5$

$f(-\pi/4) = 2(-\pi/4) - \tan(-\pi/4)$

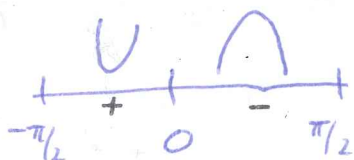
$= -\pi/2 - (-1)$

$= -\pi/2 + 1 \approx -0.5$

$y'' = -2[\sec x] \cdot \sec x \tan x$

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

$y'' = \frac{-2 \sin x}{\cos^3 x} \quad x = 0, \pi, \pi/2$



$y' = 2 - [\sec x]^2$

$-2 \sin x = 0 \quad \cos^3 x = 0$

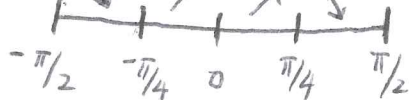
$\sin x = 0 \quad \cos x = 0$

$x = 0, \pi, -\pi \quad x = \pi/2, -\pi/2$

Concave up $(-\pi/2, 0)$ b/c $f''(x) > 0$

Concave down $(0, \pi/2)$ b/c $f''(x) < 0$

POI $(0, 0)$ b/c $f''(x)$ change signs



p. 216

Given Domain: $0 < x < \pi$

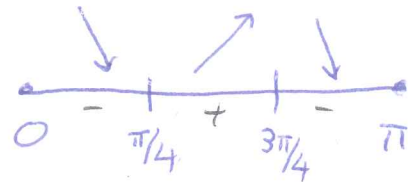
42) $y = 2(x-2) + \cot x = 2x - 4 + \cot x$

U.A. $x=0, x=\pi$

$$y' = 2 - \csc^2 x = 2 - \frac{1}{\sin^2 x}$$

$$0 = 2 - \frac{1}{\sin^2 x}$$

$$\frac{1}{\sin^2 x} = 2 \quad \sin^2 x = \frac{1}{2} \quad \sin x = \pm \frac{\sqrt{2}}{2} \quad x = \frac{\pi}{4}, \frac{3\pi}{4}$$



Dec: $(0, \frac{\pi}{4}) \cup (\frac{3\pi}{4}, \pi)$ b/c $f'(x) < 0$ } $f(\frac{\pi}{4}) = 2(\frac{\pi}{4}) - 4 + \cot(\frac{\pi}{4})$

Inc: $(\frac{\pi}{4}, \frac{3\pi}{4})$ b/c $f'(x) > 0$ } $f(\frac{\pi}{4}) = \frac{\pi}{2} - 4 + 1$

Rel. max $(\frac{3\pi}{4}, \frac{3\pi}{2} - 5)$ b/c $f'(x)$ changes from + to -

Rel. min $(\frac{\pi}{4}, \frac{\pi}{2} - 3)$ b/c $f'(x)$ changes from - to +

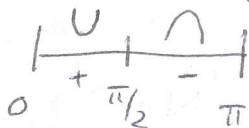
$$y' = 2 - [\csc x]^2$$

$$y'' = 0 - 2[\csc x] \cdot (-\csc x \cot x)$$

$$0 = (2 \csc^2 x \cot x)$$

$$2 \csc^2 x = 0 \quad \cot x = 0$$

none | $x = \frac{\pi}{2}$



POI $(\frac{\pi}{2}, \pi - 4)$ b/c $f''(x)$ change signs

