#13 HW 17

$\rightarrow f(1) = 10$

$\rightarrow f'(x) \geq 2$

$\boxed{1 \leq x \leq 4}$

min $f(4)$?

$$\boxed{f'(c) = \frac{f(b) - f(a)}{b - a}}$$

$$2 \leq \cancel{f'(c)} = \frac{f(b) - 10}{4 - 1}$$

$$2 \leq \frac{f(b) - 10}{3}$$

$$6 \leq f(b) - 10$$

$$\boxed{16 \leq f(4)}$$

#7 HW16

$f(x) = \sin(x)\cos(x)$ $[0, 2\pi]$

$f'(x) = \cos(x)\cos(x) + \sin(x)(-\sin(x))$

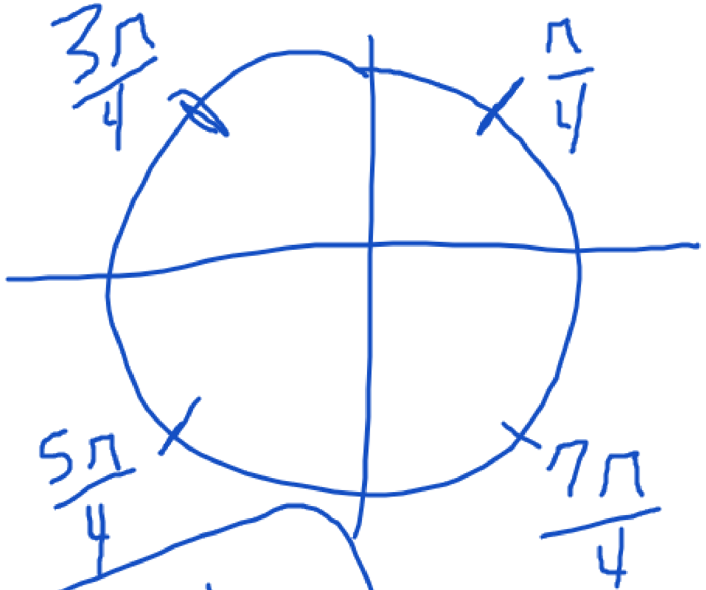
$0 = \underbrace{\cos^2(x) - \sin^2(x)}$

$\cos^2(x) = \sin^2(x)$ | $\rightarrow \overbrace{(\cos(x) + \sin(x))}\overbrace{(\cos(x) - \sin(x))} = 0$

$$\left.\begin{aligned} \cos(x) + \sin(x) &= 0 \\ \cos(x) - \underline{\sin(x)} &= 0 \end{aligned}\right\}$$

$\cos(x) = -\sin(x) \leftarrow x = \frac{3\pi}{4}, \frac{7\pi}{4}$

$\cos(x) = \sin(x) \leftarrow x = \frac{\pi}{4}, x = \frac{5\pi}{4}$



$f(x) = \sin(x)\cos(x)$

$f(0) = 0$

$f(2\pi) = 0$

$\rightarrow f\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{2}}{2} = \frac{2}{4} = \boxed{1/2}$

$f\left(\frac{3\pi}{4}\right) = \frac{\sqrt{2}}{2} \cdot -\frac{\sqrt{2}}{2} = -2/4 = \boxed{-1/2}$

$\rightarrow f(5\pi/4) = -\frac{\sqrt{2}}{2} \cdot -\frac{\sqrt{2}}{2} = \frac{2}{4} = \boxed{1/2}$

$f(7\pi/4) = -\frac{\sqrt{2}}{2} \cdot \frac{\sqrt{2}}{2} = \boxed{-1/2}$

abs max @ $\frac{1}{2}$

abs min @ $-\frac{1}{2}$

#1) HW 18

$f(x) = \boxed{x^2 - x - \ln(x)}$

critical points:

$\cancel{x = 0}$

$f'(x) = 2x - 1 - \frac{1}{x}$

$\frac{2x^2 - x - 1}{x} = \frac{(2x+1)(x-1)}{x} \rightarrow \boxed{x = 1}$

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

$-$ $+$

$f'(x) = $ 0, 0.5, 1

$2(0.5) - 1 - 2 = 1 - 1 - 2 = -2 < 0$

$2(2) - 1 - \frac{1}{2} = 4 - 1.5 = 2.5 > 0$

$\boxed{f'(x) \uparrow \ (1, \infty), \ f'(x) \downarrow \ (0, 1)}$

$$f(x) = x^2 - x - \ln(x)$$

$$f'(x) = 2x - 1 - \frac{1}{x}$$

$$f''(x) = 2 + \frac{1}{x^2}$$

$$\frac{2x^2+1}{x^2}$$

inflection point

$\cancel{x = 0}$

$f''(x)$: $+$ on $(0, \infty)$

0

1

$$2 + \frac{1}{1} = 3 > 0$$

$f(x)$ concave up $(0, \infty)$

$f(x)$ concave down never

MVT

- continuous $[a,b]$
- diff. (a,b)

Rolle's Thm

- cont $[a,b]$
- diff (a,b)
- $f(a)=f(b)$

$f'(c)=0$