WS #3 Trig Unit Review WS #3

6) $f(x) = \frac{1}{2}x - \cos x \quad [-\pi, \pi]$

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

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

$0 = \frac{1}{2} + \sin x$

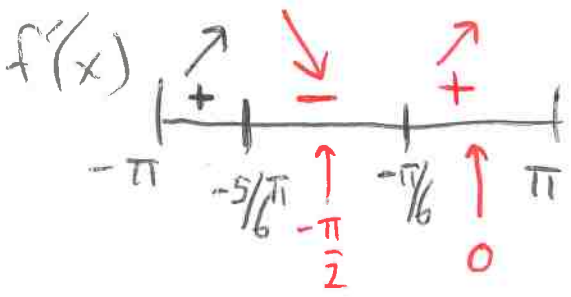
$\sin x = -\frac{1}{2}$

$x = \frac{7\pi}{6}, \frac{11\pi}{6}$

$-\frac{12\pi}{6} \quad -\frac{12\pi}{6}$

$x = -\frac{5\pi}{6}, -\frac{\pi}{6}$

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



$f'(-\frac{\pi}{2}) = \frac{1}{2} + \sin(-\frac{\pi}{2})$

$f'(0) = \frac{1}{2} + \sin(0)$

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

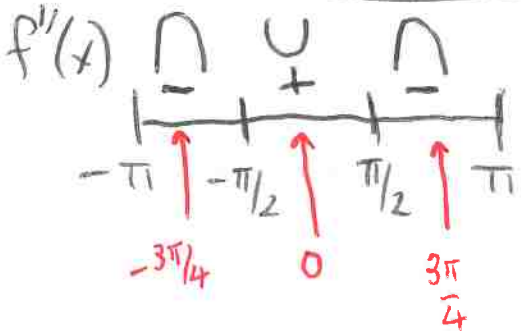
$0 = \cos x$

$\cos x = 0$

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

$-\frac{4\pi}{2} \quad -\frac{4\pi}{2}$

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



+8π/4

$f''(-\frac{3\pi}{4}) = \cos(-\frac{3\pi}{4}) = \cos(\frac{5\pi}{4})$

$f''(0) = \cos(0) = 1$

$f''(3\pi/4) = \cos(3\pi/4) < 0$

6 Continued | Sketch graph $f(x) = \frac{1}{2}x - \cos x$ $[-\pi, \pi]$

$\sqrt{3} = 1.7$
$\sqrt{2} = 1.4$

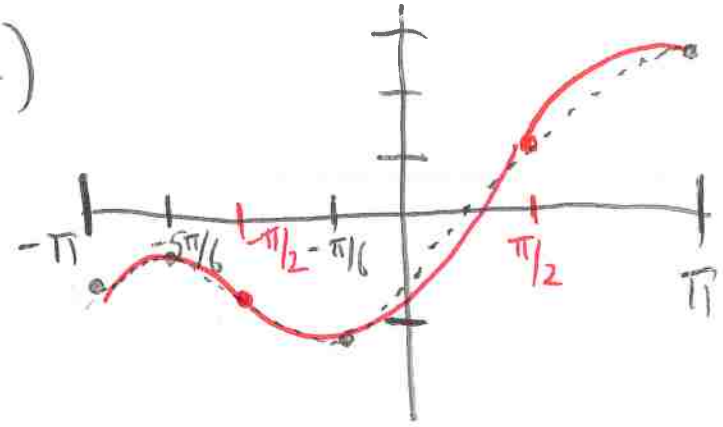
$f(-\pi) = \frac{-\pi}{2} - \cos(-\pi) = -1.5 + 1 \simeq \boxed{-0.5}$

$f(\pi) = \frac{\pi}{2} - \cos(\pi) = 1.5 - (-1) \simeq \boxed{2.5}$

$f\left(\frac{-5\pi}{6}\right) = \frac{1}{2} \cdot \frac{-5\pi}{6} - \cos\left(\frac{-5\pi}{6}\right) = -1.2 + \frac{\sqrt{3}}{2} \simeq -1.2 + 0.9 \simeq \boxed{-0.3}$

$f(-\pi/6) = \frac{1}{2}\left(\frac{-\pi}{6}\right) - \cos(-\pi/6) = -0.2 - \frac{\sqrt{3}}{2} = -0.2 - 0.9 \simeq \boxed{-1.1}$

$f(x)$



Abs max $\simeq y = 2.5$

Abs min $\simeq y = -1.1$

2) Particle motion problem

position function $x(t) = e^{\csc(t)}$ on $\left[\pi/6, 5\pi/6\right]$

a) Find $v(t)$ b) Find where particle is at rest

c) Find interval particle is moving left, moving right. Justify with b/c statement.

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a) $* \frac{d}{dx} e^u = e^u \cdot u'$ $\quad v(t) = e^{\csc(t)} \cdot (-\csc t)(\cot t)$

b) $0 = e^{\csc(t)} \cdot (-\csc(t))(\cot(t))$

$e^{\csc(t)} \neq 0$

$-\csc(t) = 0$	$\cot(t) = 0$
$\frac{-1}{\sin(t)} = 0$	$\frac{\cos(t)}{\sin(t)} = 0$
$\csc(t) \neq 0$	$\cos(t) = 0$
	$t = \frac{\pi}{2}, \cancel{3\pi/2}$

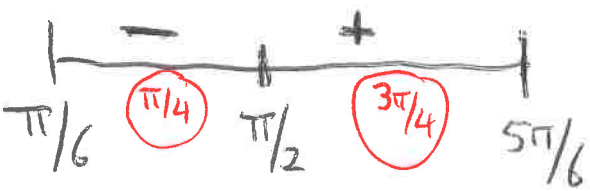
particle at rest when $t = \pi/2$ b/c $v(t) = 0$

$v(t) = -e^{\csc(t)} \csc(t)\cot(t)$

c) $v(t)$ sign line

$v(\pi/4) = -e^{\csc(\pi/4)} \csc(\pi/4)\cot(\pi/4)$

$v(3\pi/4) = -e^{\csc(3\pi/4)} \csc(3\pi/4)\cot(3\pi/4)$



particle moving left $(\frac{\pi}{6}, \pi/2)$ b/c $v(t) < 0$

moving right $(\pi/2, 5\pi/6)$ b/c $v(t) > 0$