

3) $f(x) = \sin(2x) + x$

$[0, 2\pi]$

$f(0) = \sin(0) + 0 = 0$

$f(2\pi) = \sin(4\pi) + 2\pi = 2\pi$

slope: $m = \frac{2\pi - 0}{2\pi - 0} = 1$

$f'(x) = \cos(2x) \cdot 2 + 1$

$f'(x) = 2\cos(2x) + 1$

$2\cos(2x) + 1 = 1$

$\frac{2\cos(2x)}{2} = \frac{0}{2}$

$\cos(2x) = 0$

$\cos(2x) = 0$

~~$\cos^{-1}(\cos(2x)) = \cos^{-1}(0)$~~

$\cos \theta = 0?$

$2x = \cos^{-1}(0)$

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

Add 2π
 $+ \frac{4\pi}{2}$

~~$2x = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}, \frac{7\pi}{2}, \frac{9\pi}{2}, \frac{11\pi}{2}$~~

~~$x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}, \frac{9\pi}{4}, \frac{11\pi}{4}$~~

$C = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

$\frac{8\pi}{4}$

4) $f(x) = x - 2\cos x$

$[-\pi, \pi]$

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

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

S/A
T/C

$1 + 2\sin x = 0$

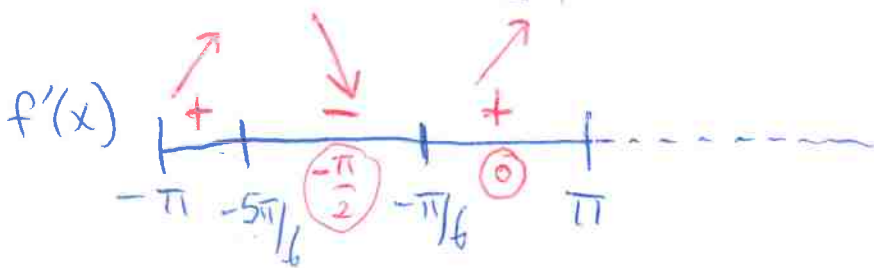
$2\sin x = -1$

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

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

$\frac{7\pi}{6} - \frac{12\pi}{6} = -\frac{5\pi}{6}$

$\frac{11\pi}{6} - \frac{12\pi}{6} = -\frac{\pi}{6}$



Inc: $(-\pi, -\frac{5\pi}{6}) \cup (-\frac{\pi}{6}, \pi)$ b/c $f'(x) > 0$

Dec: $(-\frac{5\pi}{6}, -\frac{\pi}{6})$ b/c $f'(x) < 0$

Rel. max $(-\frac{5\pi}{6}, \frac{-5\pi}{6} + \sqrt{3})$ b/c $f'(x)$

changes from + to -

-0.3

Rel. min $(-\frac{\pi}{6}, \frac{-\pi}{6} - \sqrt{3})$ b/c $f'(x)$

changes from - to +

-2

$f(-\frac{5\pi}{6}) = -\frac{5\pi}{6} - 2\cos(-\frac{5\pi}{6})$

$= -\frac{5\pi}{6} - 2(-\frac{\sqrt{3}}{2})$

$= -\frac{5\pi}{6} + \sqrt{3} \rightarrow -\frac{15}{6} + 1.7$

$-2 + 1.7 \approx -0.3$

$f(-\frac{\pi}{6}) = -\frac{\pi}{6} - 2\cos(-\frac{\pi}{6}) = -\frac{\pi}{6} - 2(\frac{\sqrt{3}}{2}) = -\frac{\pi}{6} - \sqrt{3} = -0.5 - 1.7$

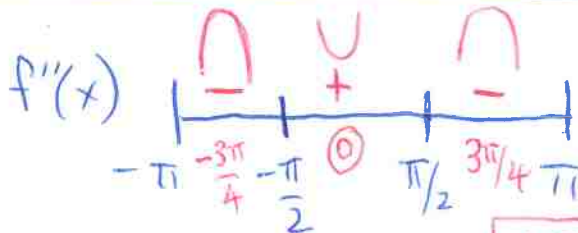
$f'(x) = 1 + 2\sin x$

$f''(x) = 2\cos x$

$2\cos x = 0$

$\cos x = 0$

$x = \frac{\pi}{2}, \frac{3\pi}{2} - \frac{4\pi}{2} = -\frac{\pi}{2}$



$f(-\frac{\pi}{2}) = -\frac{\pi}{2} - 2\cos(-\frac{\pi}{2})$

$f(\frac{\pi}{2}) = \frac{\pi}{2} - 2\cos(\frac{\pi}{2})$

POI at $(-\frac{\pi}{2}, -\frac{\pi}{2})$ and $(\frac{\pi}{2}, \frac{\pi}{2})$

b/c $f''(x)$ change signs

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

Concave down $(-\pi, -\frac{\pi}{2}) \cup (\frac{\pi}{2}, \pi)$ b/c $f''(x) < 0$

-1.5

1.5

sketch graph $[-\pi, \pi]$

$$f(x) = x - 2\cos x$$

$$f(-\pi) = -\pi - 2\cos(-\pi) = -\pi + 2 \approx -3 + 2 \approx \boxed{-1}$$

$$f(\pi) = \pi - 2\cos(\pi) = \pi + 2 \approx \boxed{5}$$

$f(x)$

