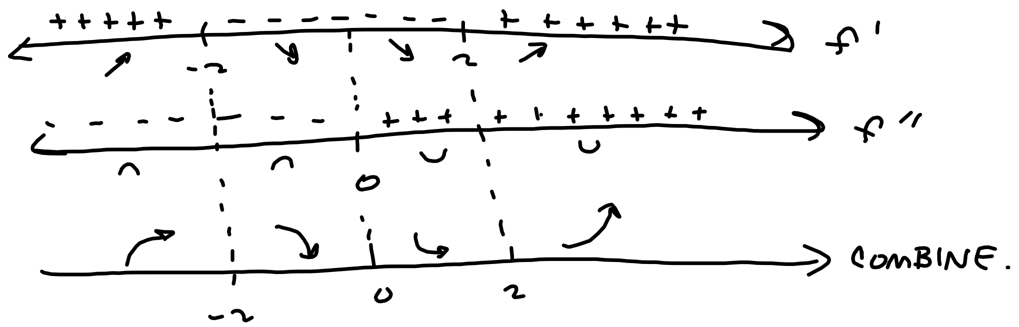
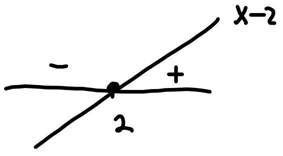
$f(x) = x^3 - 12x + 2$

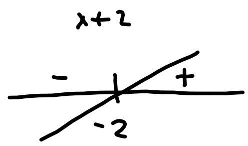
$f'(x) = 3x^2 - 12 = 3(x^2-4) = 3(x-2)(x+2) = 0 \rightarrow x \in \{-2, 2\}$

$f''(x) = 6x = 0 \Rightarrow x \in \{0\}$



f':	$x-2$	$x+2$	f'	
$x < -2$	$-$	$-$	$+$	$(-\infty, -2)$
$-2 < x < 2$	$-$	$+$	$-$	$(-2, 2)$
$2 < x$	$+$	$+$	$+$	$(2, \infty)$





Graph One Period!

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

$= 2\sin^2 x - \sin(x) - 1$

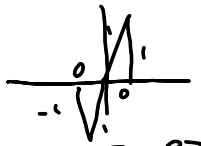
$\Longrightarrow f'(x) = 4\sin(x)\cos(x) - \cos(x)$

$= \cos(x)(4\sin(x) - 1) \overset{\text{SET}}{=} 0$

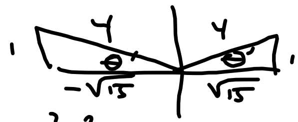
$\Rightarrow \cos(x) = 0$ or $4\sin(x) - 1 = 0$

$4\sin(x) = 1$

$\sin(x) = \frac{1}{4}$



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



$4^2 - 1^2$
$= 15$

$x = \arcsin(\frac{1}{4})$,
$\pi - \arcsin(\frac{1}{4})$
$\theta' = \arcsin(\frac{1}{4})$
θ' = reference angle

zeros of f': $\frac{\pi}{2}, \frac{3\pi}{2}, \arcsin(\frac{1}{4}), \pi - \arcsin(\frac{1}{4})$

$\approx 1.57, 4.71, .25, 2.89,$

0	---	.25	+++++	1.57	---	2.89	+++	4.71	----	6.28	f'
	↘		↗		↘		↗		↘		

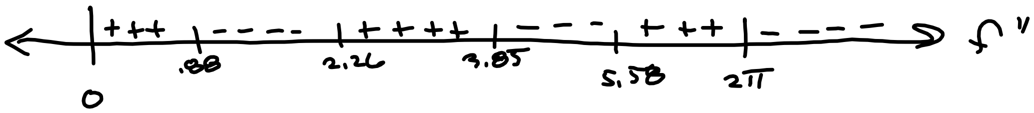
	Test	
(0, .25)	.1	−.6
(.25, 1.57)	.5	.8
(1.57, 2.88)	2	− 1.1
(2.88, 4.71)	3	.4
(4.71, 6.28)	5	−1.37

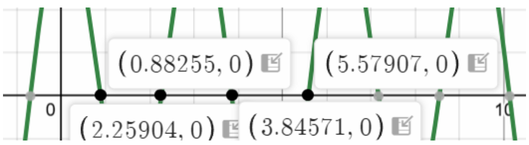
$6.28 \approx 2\pi$

$f'(x) = 4\sin(x)\cos(x) - \cos(x) \longrightarrow$

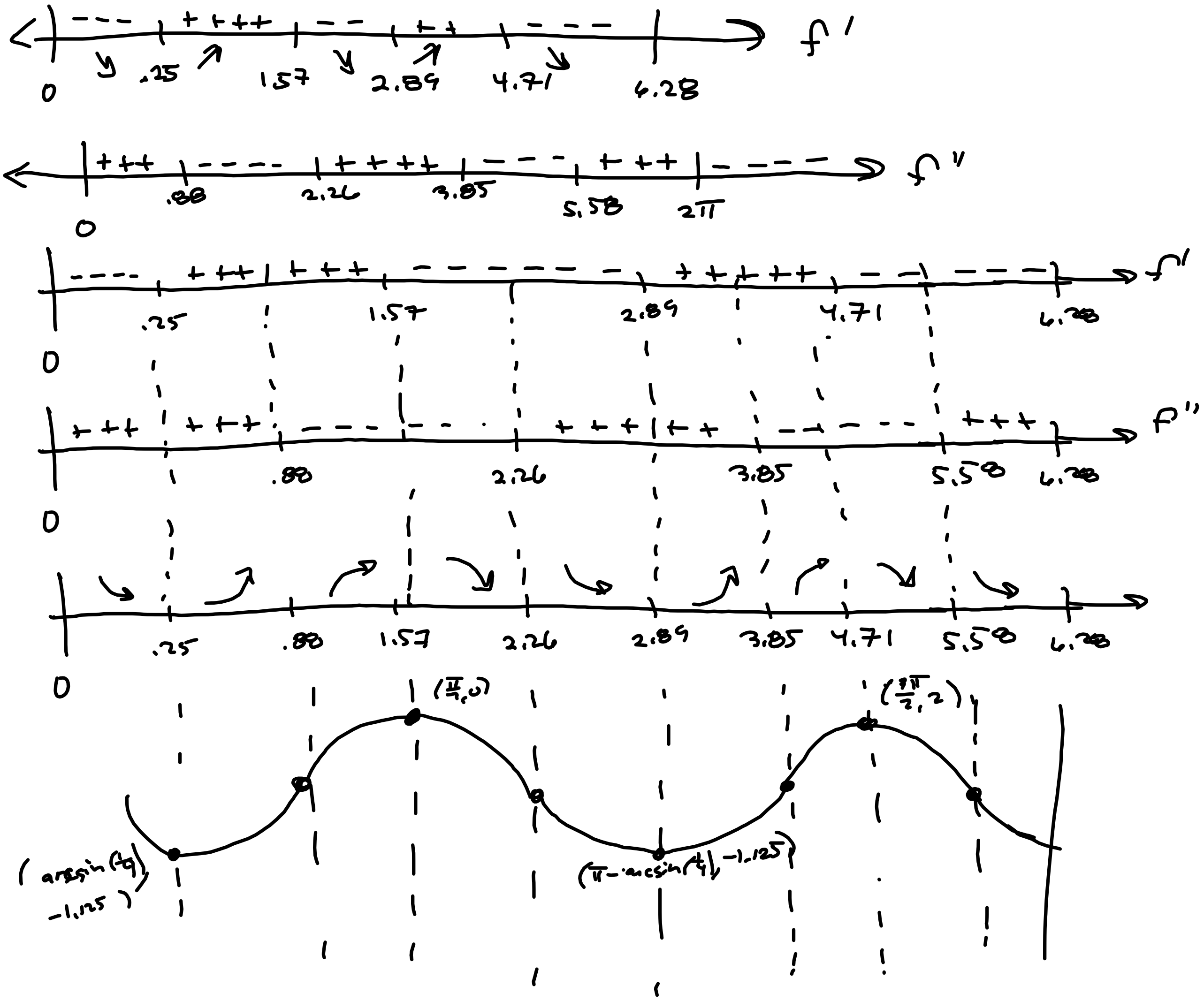
$$f''(x) = 4\cos^2(x) + 4\sin(x)(-\sin(x)) + \sin(x)$$
$$= 4\cos^2(x) - 4\sin^2(x) + \sin(x)$$
$$= 4(1-\sin^2(x)) - 4\sin^2(x) + \sin(x)$$
$$= 4 - 4\sin^2(x) - 4\sin^2(x) + \sin(x)$$
$$= -8\sin^2(x) + \sin(x) + 4 \overset{SET}{=} 0$$
$$\Rightarrow -8u^2 + u + 4 = 0$$
$$\Rightarrow 8u^2 - u - 4 = 0$$
$a=8, b=-1, c=-4$

$$\Rightarrow b^2 - 4ac = 1 - 4(8)(-4) \qquad 3 \overline{)129} \; 43$$
$$= 1 + 128 = 129$$
$$u = \frac{-1 \pm \sqrt{129}}{2(4)} = \frac{-1 \pm \sqrt{129}}{8}$$
$$\sin(x) = \frac{-1 \pm \sqrt{129}}{8}$$
$$\sin(x) = \frac{-1-\sqrt{129}}{8}, \quad \frac{-1+\sqrt{129}}{8}$$

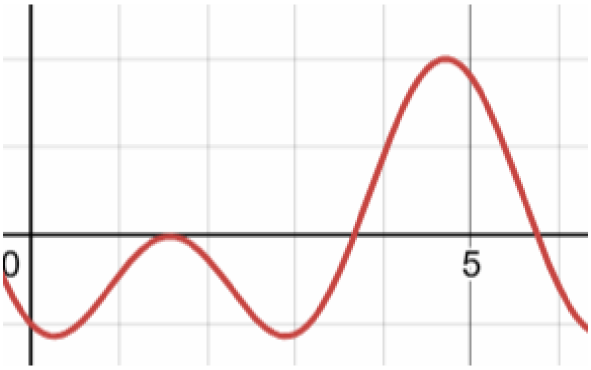




Test:	f'
.5	2.6
1	-.82
2.5	1.43
4	-1.34



Here's a rough idea. We don't know the actual values of ***f*** **at these key points.**



Actual Graph