3.5

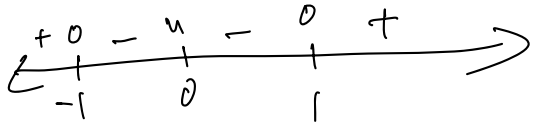
29, 37, 40, 57

29) $y = x - 3x^{\frac{5}{3}}$

$x = 3x^{\frac{5}{3}} \Rightarrow x^{\frac{2}{3}} = 3 \quad x = 3^{\frac{3}{2}} = \sqrt{27}, -\sqrt{27}$

Zeroes: $x = 0, \sqrt{27}, -\sqrt{27}$

$y' = 1 - x^{-\frac{2}{3}}$



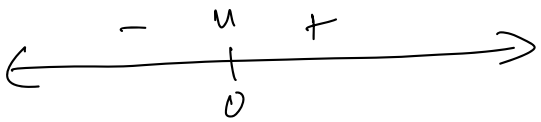
$y'(27) = 1 - \frac{1}{9}$

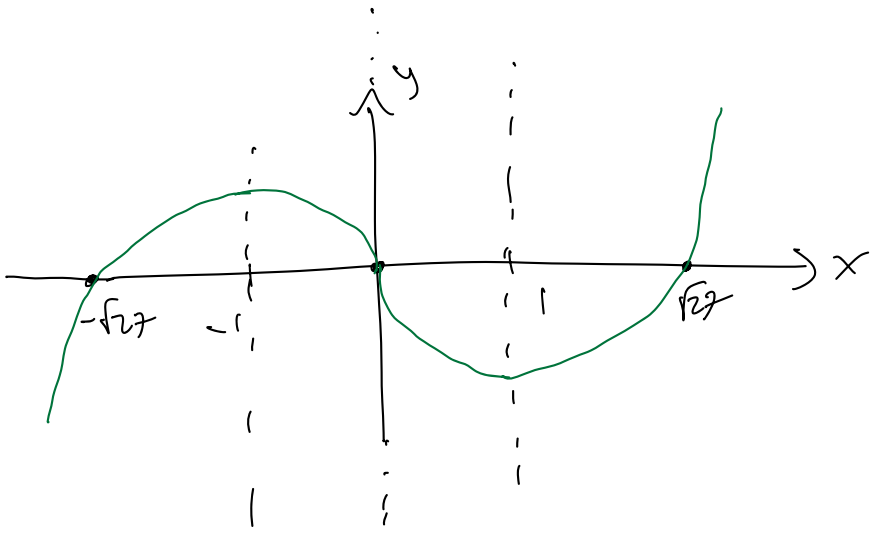
$y'\left(\frac{1}{27}\right) = 1 - \frac{1}{\frac{1}{9}}$

$y'\left(\frac{-1}{27}\right) = 1 - \frac{1}{}$

$\left(1 - x^{-\frac{1}{3}}\right)\left(1 + x^{-\frac{1}{3}}\right) = 0$

$y'' = x^{-\frac{5}{3}}$

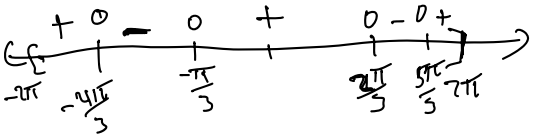




37) $y = \sin x + \sqrt{3}\cos x$

$\sin x = -\sqrt{3}\cos x$

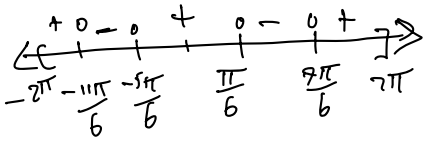
$\tan x = -\sqrt{3}$



$y' = \cos x - \sqrt{3}\sin x$

$\cos x = \sqrt{3}\sin x$

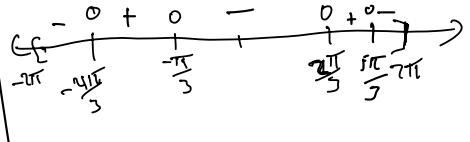
$\tan x = \frac{1}{\sqrt{3}}$



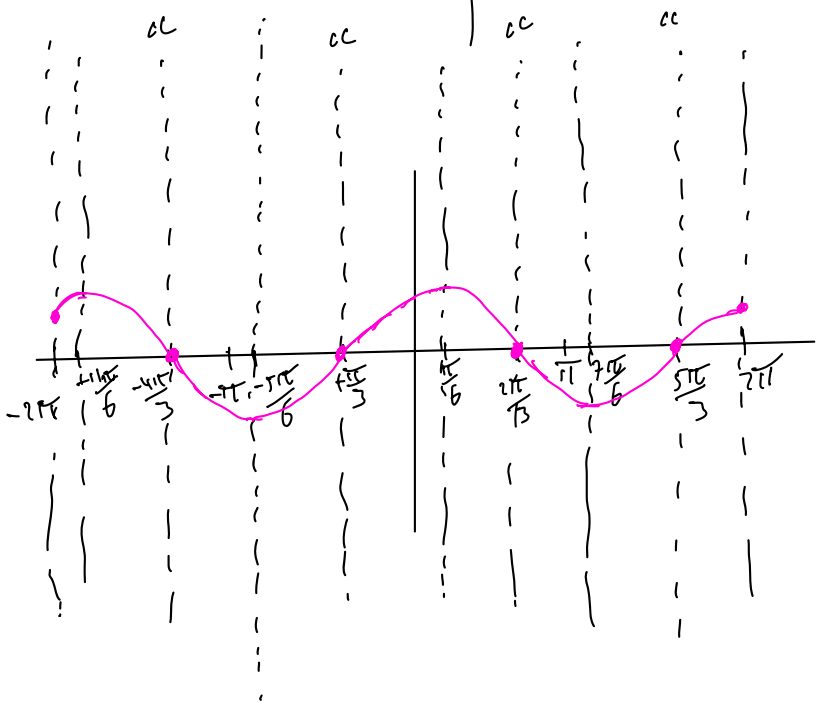
$y'' = -\sin x - \sqrt{3}\cos x$

$\sin x = -\sqrt{3}\cos x$

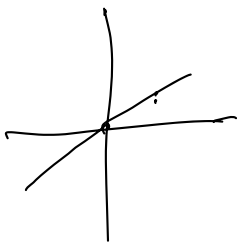
$\tan x = -\sqrt{3}$



$x \in [-2\pi, 2\pi]$



So @ every x-int. there is an infl. pt.



$$y = \frac{\sin x}{2+\cos x}$$

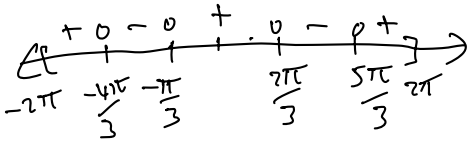
$y = 0$ if

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

$$y' = \frac{(\cos x)(2+\cos x) + \sin^2 x}{(2+\cos x)^2}$$

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

$y' = 0$ if $\cos x = -\frac{1}{2}$

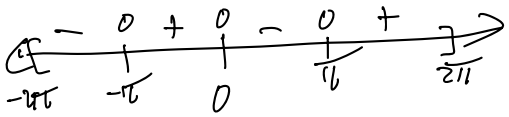


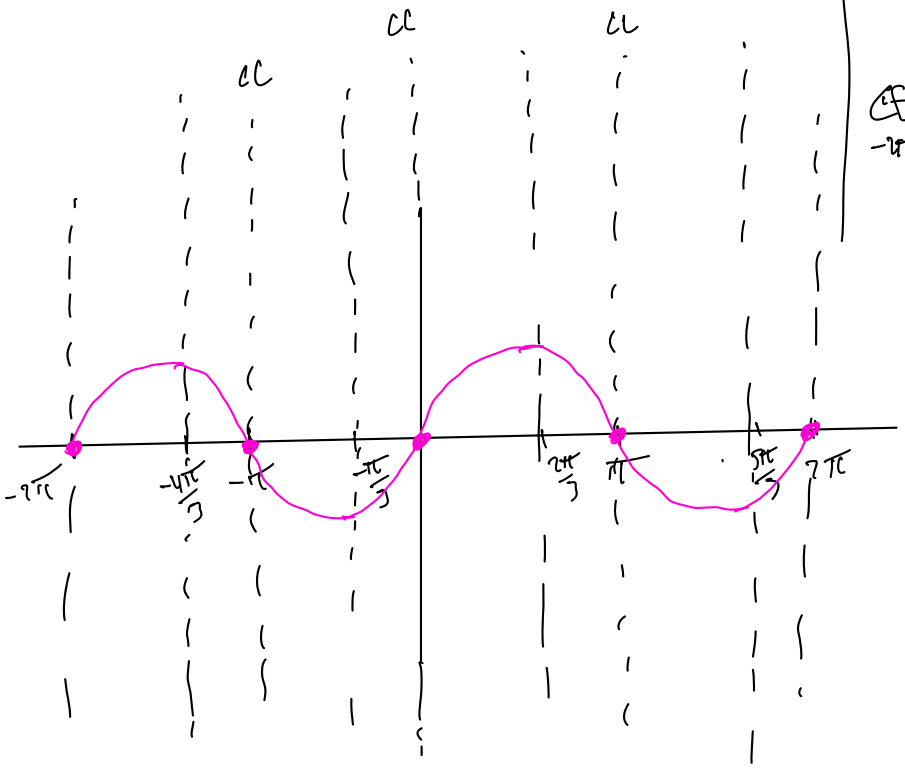
$$y'' = \frac{(-2\sin x)(2+\cos x)^2 - 2(2+\cos x)(-\sin x)(1+2\cos x)}{(2+\cos x)^2}$$

$$= \frac{(-2\sin x)(2+\cos x) + 2\sin x(1+2\cos x)}{(2+\cos x)}$$

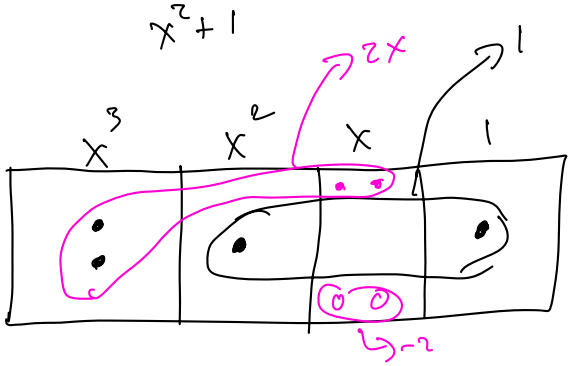
$$= \frac{(2\sin x)(1+2\cos x - 2 - \cos x)}{(2+\cos x)}$$

$$= \frac{(2\sin x)(\cos x - 1)}{(2+\cos x)}$$

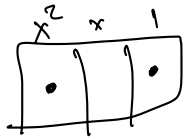




57) $y = \dfrac{2x^3+x^2+1}{x^2+1} =$



$\div$



$= 2x + 1 - \dfrac{2x}{x^2+1}$

$y = 2x + 1 - \dfrac{2x}{x^2+1}$

$y(-1) = \dfrac{-2+1+1}{2} = 0$

$y' = 2 - \dfrac{2(x^2+1) - 2x \cdot 2x}{(x^2+1)^2}$

$= 2 - \dfrac{2 - 2x^2}{(x^2+1)^2}$

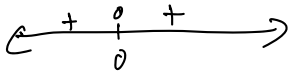
$= 2 + \dfrac{2x^2 - 2}{(x^2+1)^2}$

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

$(x^2+1)^2 = 1 - x^2$

$x^4 + 2x^2 + 1 = 1 - x^2$

$x^4 + 3x^2 = 0 \quad x = 0$



$y'' = \dfrac{4x(x^2+1)^2 - 2(x^2+1)2x(2x^2-2)}{(x^2+1)^4}$

$= \dfrac{4x(x^2+1) - 4x(2x^2-2)}{(x^2+1)^3}$ ($4x^3+4x$, $-8x^3+8x$)

$= \dfrac{12x - 4x^3}{(x^2+1)^3} = \dfrac{4x(3-x^2)}{(x^2+1)^3}$