

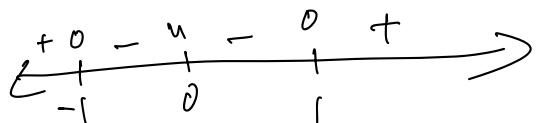
~~3.5~~  
29, 37, 40, 57

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

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

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

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



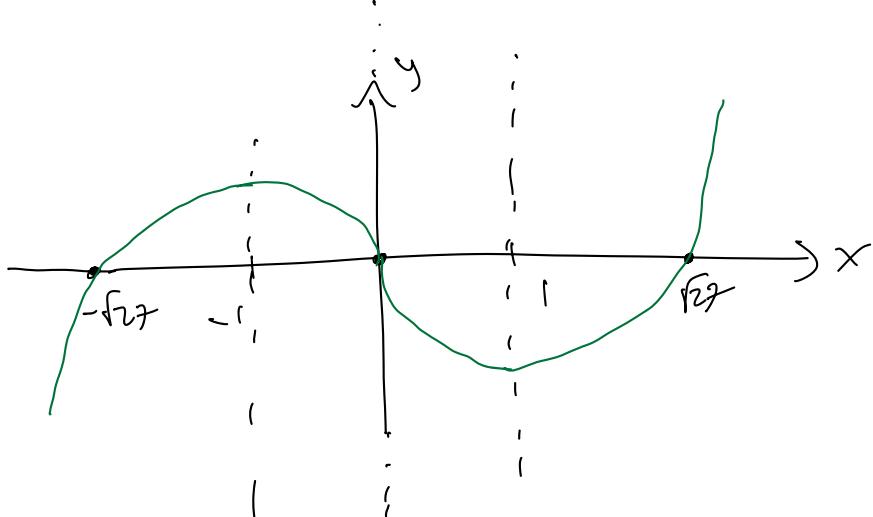
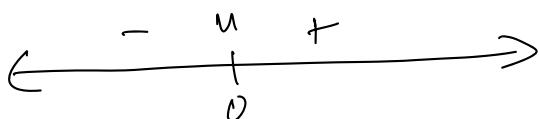
$$y'(-\sqrt{27}) = 1 - \frac{1}{9}$$

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

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

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

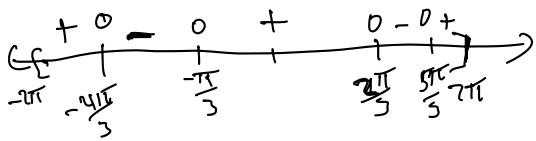
$$y'' = x^{-\frac{5}{3}}$$



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

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

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

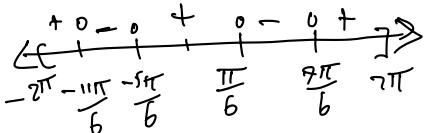


$$x \in [-\pi, 2\pi]$$

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

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

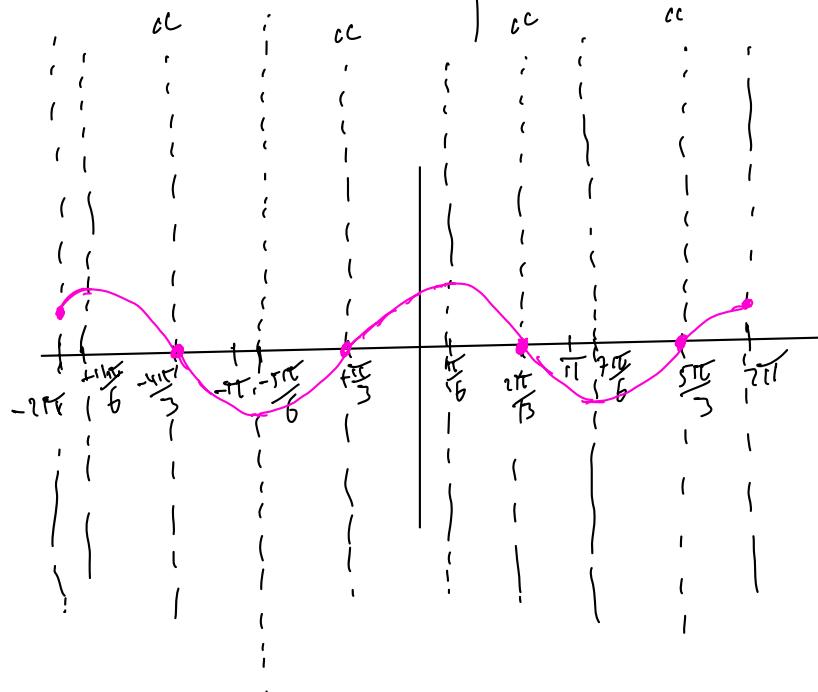
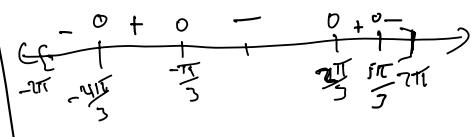
$$\tan x = \frac{1}{\sqrt{3}}$$



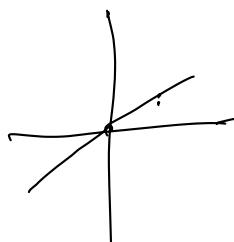
$$y'' = -\sin x - \sqrt{3} \cos x$$

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

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



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



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

$$y=0 \text{ if}$$

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

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

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

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

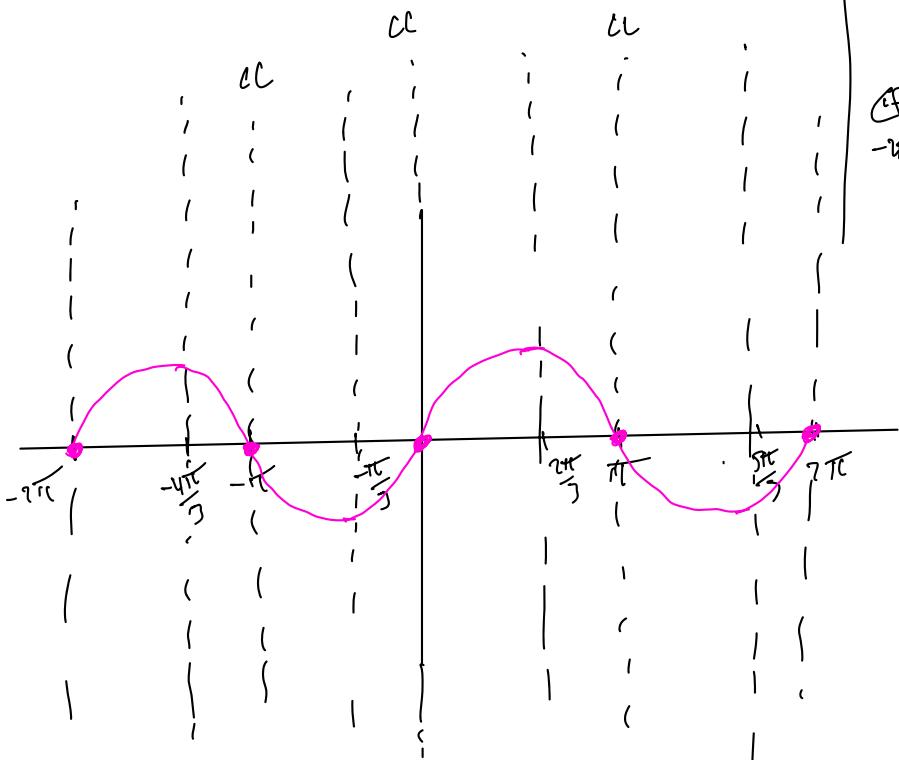
$$\begin{array}{ccccccc} & + & 0 & - & 0 & + & 0 \\ \text{if} & -2\pi & -\frac{4\pi}{3} & -\frac{\pi}{3} & \frac{\pi}{3} & \frac{5\pi}{3} & 2\pi \end{array}$$

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

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

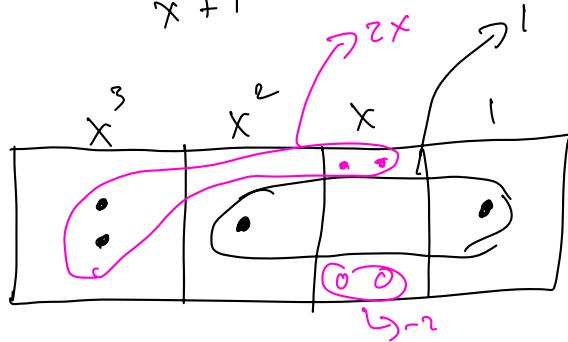
$$= \frac{(2 \sin x)(1 + 2 \cos x - 2 - \cos x)}{(2 + \cos x)}$$

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



$$\begin{array}{ccccccc} & - & 0 & + & 0 & - & 0 & + \\ \text{if} & -2\pi & -\pi & 0 & \frac{\pi}{6} & \frac{7\pi}{6} & 2\pi \end{array}$$

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



$$\div \begin{array}{|c|c|c|} \hline x^2 & x & 1 \\ \hline \cdot & | & \cdot \\ \hline \end{array} = 2x + 1 - \frac{2x}{x^2 + 1}$$

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

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

$$\begin{aligned} y' &= 2 - \frac{2(x^2+1) - 2x \cdot 2x}{(x^2+1)^2} \\ &= 2 - \frac{2 - 2x^2}{(x^2+1)^2} \\ &= 2 + \frac{2x^2 - 2}{(x^2+1)^2} \end{aligned}$$

$$\begin{aligned} 0 &= 1 + \frac{x^2 - 1}{(x^2+1)^2} \\ (x^2+1)^2 &= 1 - x^2 \\ x^4 + 2x^2 + 1 &= 1 - x^2 \\ x^4 + 3x^2 &= 0 \quad x=0 \\ &\text{sign chart: } + \text{ at } 0 \end{aligned}$$

$$\begin{aligned} y'' &= \frac{4x(x^2+1)^2 - 2(x^2+1) \cdot 2x(2x^2-2)}{(x^2+1)^3} \\ &= \frac{4x^3 + 4x - 8x^3 + 8x}{(x^2+1)^3} \\ &= \frac{12x - 4x^3}{(x^2+1)^3} = \frac{4x(3-x^2)}{(x^2+1)^3} \\ &\text{sign chart: } + \text{ at } 0, - \text{ at } \sqrt{3}, + \text{ at } \sqrt{3} \end{aligned}$$

