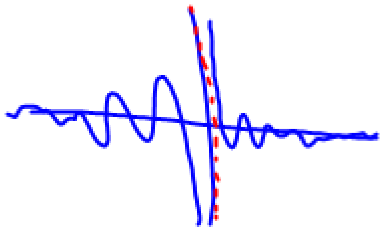
Cont. 3.5

$$\lim_{x \to \infty} \cos x = \text{DNE}$$

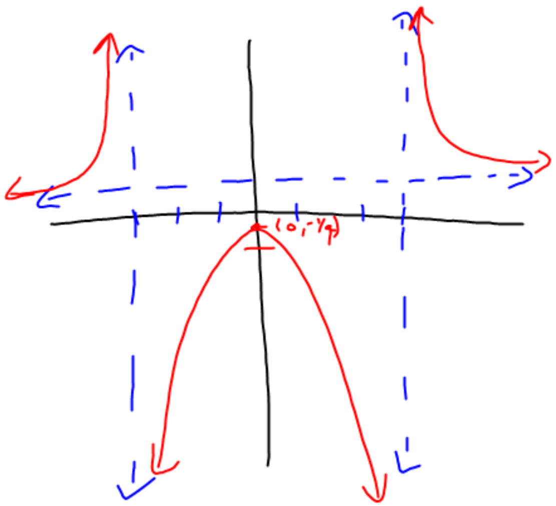
$$\lim_{x \to \infty} \frac{\cos x}{x} = 0$$



3.6 Graph

$$y = \frac{x^2+1}{x^2-9}$$

y int: $(0, -1/9)$
(bottom)
VA: $x=3$ $x=-3$
HA: $y=1$



$$y' = \frac{(x^2-9)(2x)-(x^2+1)(2x)}{(x^2-9)^2}$$

$$y' = \frac{2x^3-18x-2x^3-2x}{(x^2-9)^2}$$

$$y' = \frac{-20x}{(x^2-9)^2}$$

C.P.
$-20x=0$
$x=0$

$$\boxed{+ \quad 0 \quad - \quad \text{inc} \quad \text{dec} \quad \text{max}} \quad \boxed{(0, -1/9)} \text{ max}$$

$$y'' = \frac{(x^2-9)^2(-20)-(-20x)2(x^2-9)(2x)}{(x^2-9)^4}$$

$$y'' = \frac{-20(x^2-9)(x^2-9-(4x^2))}{(x^2-9)^4}$$

$$y'' = \frac{-20(-3x^2-9)}{(x^2-9)^3}$$

$$= \frac{60(x^2+3)}{(x^2-9)^3}$$

* Since $x^2+3=0$ will give imaginary #'s
So plug your C.P. into y''

$y''(0) < 0$
Concave ↓

$$f(x) = \frac{x^3}{x^2-4}$$

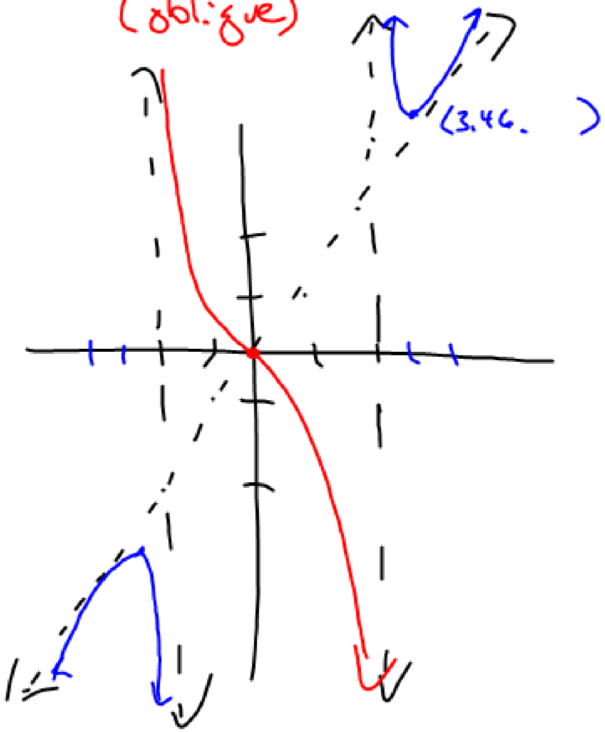
y int: (0, 0)

VA: $x = \pm 2$

~~HA~~:

$$x^2-4 \overline{\big)\, x^3} \quad x$$
$$-x^3 + 4x$$

Slant: $y = x$
(oblique)



$$y' = \frac{(x^2-4)(3x^2) - x^3(2x)}{(x^2-4)^2}$$

$$y' = \frac{3x^4 - 12x^2 - 2x^4}{(x^2-4)^2}$$

$$y' = \frac{x^4 - 12x^2}{(x^2-4)^2}$$

C.P.
$x^4 - 12x^2 = 0$
$x^2(x^2-12) = 0$
$x = 0 \quad x = \pm\sqrt{12}$
$x \approx \pm 3.46$

+ − − +
−3.46 0 3.46

* Use Calc for 2nd Deriv

$$d\left(\frac{x^3}{x^2-4}, x, 2\right)$$

tells Calc to do y''

$$y'' = \frac{8x(x^2+12)}{(x^2-4)^3}$$

P.O.I.
$x = 0$

+ −
−2 0 2
VA VA

Read 3.7

$$y = \frac{2x^2 - 5x + 5}{x - 2}$$