HW quiz 10-17

Find $\frac{dy}{dx}$.

① $y = 4x^3 - 2x^2 + 3 - \frac{1}{x}$

② $y = \sqrt[4]{x}$

#2

(a) $f(x) = x \cdot (-\sin x) + \cos x \cdot 1$

$= -x \cdot \sin x + \cos x$

(b) $f'(x) = x^2 \cdot \cos x + \sin x \cdot 2x$

(b) $f(x) = x^2 \cdot \sin x$

deriv

deriv.

(c) $f'(x) = x^3 \cdot e^x + e^x \cdot 3x^2$

$= x^2 e^x (x + 3)$

(d) $f'(x) = e^x \cdot \cos x + \sin x \cdot e^x$

$= e^x (\cos x + \sin x) = 0$

$x = \frac{3\pi}{4}, \frac{7\pi}{4}, \cdots$

(e) $f'(x) = e^x(-\sin x) + \cos x \cdot e^x$

$= e^x(\cos x - \sin x)$

$\frac{d}{dx}[\cos x]$

$= \lim_{h\to 0} \frac{\cos(x+h) - \cos x}{h}$

$= \lim_{h\to 0} \frac{\cos x \cos h - \sin x \sin h - \cos x}{h}$

$= \lim_{h\to 0} \frac{\cos x(\cos h - 1)}{h} + \lim_{h\to 0} \frac{-\sin x \sin h}{h}$

$= -\sin x$

The Quotient Rule

$$\frac{d}{dx}\left[\frac{u}{v}\right] = \frac{v \cdot \frac{du}{dx} - u \cdot \frac{dv}{dx}}{v^2}$$

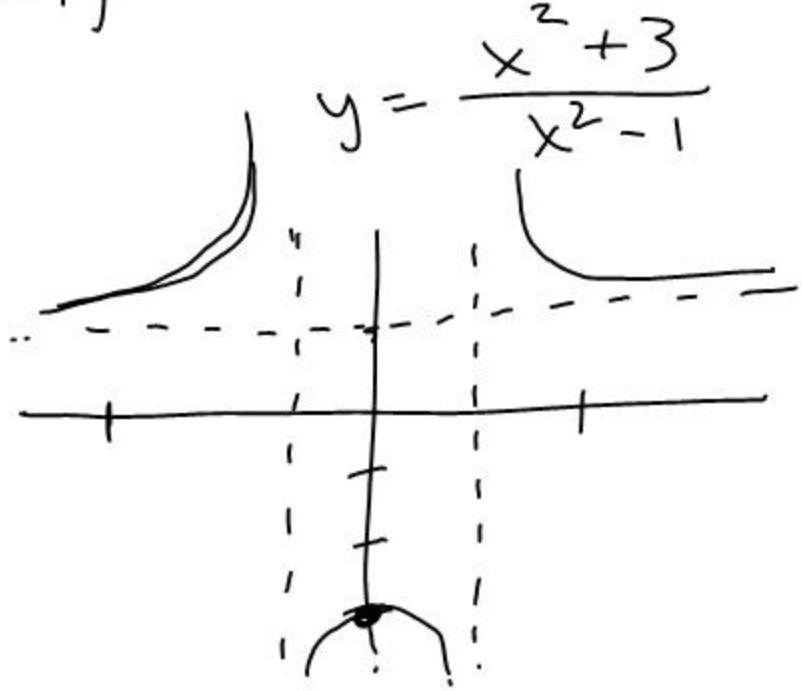
Ex $\frac{d}{dx}\left[\frac{x^2+3}{x^2-1}\right]$

$$= \frac{(x^2-1)(2x) - (x^2+3)(2x)}{(x^2-1)^2}$$

$$= \frac{2x(-4)}{(x^2-1)^2}$$

$$= \frac{-8x}{(x^2-1)^2}$$

$$y = \lim_{x \to \infty} \frac{x^2+3}{x^2-1} = 1$$



Ex

$$f(x) = \frac{e^x}{\sin x}$$

$$f'(x) = \frac{\sin x \cdot e^x - e^x \cdot \cos x}{\sin^2 x}$$

$$= \frac{e^x(\sin x - \cos x)}{\sin^2 x}$$

$$f(x) = \frac{\sin x}{\cos x} = \tan x$$

$$f'(x) = \frac{\cos x \cdot \cos x - \sin x \cdot (-\sin x)}{\cos^2 x}$$

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

$$= \sec^2 x$$

HW Quotient Rule

#3

factor the numerator if poss.

(i) use the prod + quot. rules