Taylor series $\sin(x)$ $\cos(x)$ $\sinh(x)$ $\cosh(x)$

$$\begin{cases} e^x = 1 + x + \frac{1}{2}x^2 + \frac{1}{6}x^3 + \frac{1}{24}x^4 + \frac{1}{120}x^5 + \dots \\ (e^x)' = 0 + 1 + x + \frac{1}{2}x^2 + \frac{1}{6}x^3 + \frac{1}{24}x^4 + \frac{1}{120}x^5 + \dots \end{cases}$$

$$e^x = (e^x)'$$

$$\frac{(3-5xe^x)}{3x+2} = f(x) \qquad \left(\frac{f}{g}\right)' = \frac{f'g - g'f}{g^2}$$

$$f'(x) = \frac{\underbrace{(3-5xe^x)'}\,(3x+2) - (3-5xe^x)\underbrace{(3x+2)'}_{3}}{(3x+2)^2}$$

$$(3-5xe^x)' = 0 - (5e^x + 5xe^x) \qquad x^2 \quad 2x$$

$$f'(x) = \frac{(-5e^x - 5xe^x)(3x+2) - 3(3-5xe^x)}{(3x+2)^2}$$

$$f(x) = \frac{x^{1/3} - 4}{x^{7/2}} \qquad \left(\frac{f}{g}\right)' = \frac{f'g - g'f}{g^2}$$

$$f'(x) = \frac{\left(x^{1/3} - 4\right)'\left(x^{7/2}\right) - \left(x^{7/2}\right)'\left(x^{1/3} - 4\right)}{\left(x^{7/2}\right)^2}$$

$$f'(x) = \frac{\left(\frac{1}{3}x^{-2/3}\right)\left(x^{7/2}\right) - \left(\frac{7}{2}x^{5/2}\right)\left(x^{1/3} - 4\right)}{x^7} \checkmark$$

$$f(x) = (e^x)^2 + 2e^x + xe^2 + x^e$$

$$f(x) = e^{2x} + \boxed{\underline{2}\,\underline{e^x}} + \underbrace{xe^2}_{} + x^e$$

$$(2.71\ldots)^2$$

$$f'(x) = 2(e^x)^2$$

$$= 2e^{2x} + 2e^x + e^2 + ex^{e-1}$$

$$\underline{2}\cdot\underline{e^x} = \underbrace{(2)'e^x}_{0} + \underline{2}(e^x)'$$

$$0 + 2e^x$$

$$\left(e^{2x}\right)' = 2e^{2x}$$

$$\rightarrow e^{2x} \cdot 2 = 2e^{2x}$$

$$e^{2x} = \left(e^{x}\right)^{2} = e^{x} \cdot e^{x}$$

$$\left(e^{x}\right)' e^{x} + e^{x}\left(e^{x}\right)'$$

$$\left(e^{x}\right)^{2} + \left(e^{x}\right)^{2} \rightarrow 2\left(e^{x}\right)^{2} = 2e^{2x}$$

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

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

$$(-\sin x)' = -(\cos x)'$$

$$(\sin x)' = \cos x$$

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

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

$$f(x) = \frac{1}{3}x^3 - 2x^2 + 4x + 7$$

$$f'(x) = x^2 - 4x + 4$$

$$0 = (x-2)(x-2)$$

$$\boxed{x = 2}$$

$$f(2) = \frac{1}{3}\cdot 8 - \cancel{2\cdot 4} + \cancel{4\cdot 2} + 7$$

$$\frac{8}{3} + 7 = \frac{8}{3} + \frac{21}{3} = \frac{29}{3}$$

$m = 0$

what does it mean for a function to have a horizontal tangent line

$$\rightarrow f'(x) = 0$$

$$y - \frac{29}{3} = 0(x-2)$$

$$\rightarrow \boxed{y = \frac{29}{3}}$$

$f'(x) = x^2 - 4x + 4$

$f''(x) = 2x - 4$

#7 HW 8

$f(x) = (3 - \boxed{5xe^x})(3x+2)$

$\left(0 - \left(5e^x + 5xe^x\right)\right)(3x+2) + (3 - 5xe^x)(3)$