WARMUP - In Notes

Given $F(2)=1$ $\quad G(4)=2$

$F'(2)=5$ $\quad G'(4)=6$

$F(4)=3$ $\quad G(3)=4$

$F'(4)=7$ $\quad G'(3)=8$

Find a) $H(4)$ if $H(x)=F(G(x))$

$H(4)=F(\underline{G(4)})=F(2)=1$

b) $H'(4)$ if $H(x)=F(G(x))$

$H'(4)=F'(\underline{G(4)})\cdot \underline{G'(4)}$

$=F'(2)\cdot 6$

$=5\cdot 6=30$

c) $H(4)$ if $H(x)=G(F(x))$

$H(4)=G(F(\underline{4}))=G(3)=4$

d) $H'(4)$ if $H(x)=G(F(x))$

$H'(4)=G'(F(4))\cdot F'(4)$

$=G'(3)\cdot 7=8\cdot 7=56$

e) $H'(4)$ if $H(x)=\dfrac{F(x)}{G(x)}$

$$H'(x)=\frac{G\cdot F'-F\cdot G'}{G^2}$$

$$=\frac{2\cdot 7-3\cdot 6}{2^2}$$

$$=\frac{14-18}{4}=-1$$

Section 3.5 Derivatives of Trig Functions

$$\frac{d}{dx}(\sin x)=\cos x \qquad \frac{d}{dx}(\sin(f(x)))=\cos(f(x))\cdot f'(x)$$

$$\frac{d}{dx}(\cos x)=-\sin x \qquad \frac{d}{dx}(\cos(f(x)))=-\sin(f(x))\cdot f'(x)$$

$$\frac{d}{dx}(c\cdot f(x))=cf'(x)$$

ex: $\dfrac{d}{dx}\left(2\sin(3x)\right)=\underline{2\cos(3x)\cdot 3}=6\cos(3x)$

$$\frac{d}{dx}(f(x))^n=n(f(x))^{n-1}\cdot f'(x)$$

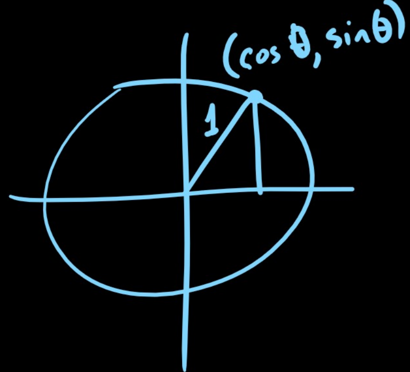
ex: $\dfrac{d}{dx}(\cos^2 x)=\dfrac{d}{dx}\left((\cos x)^2\right)=2(\cos x)^1(-\sin x)$

$=-2\cos x\sin x$

ex: $\frac{d}{dx}\left(\cos(x^2)\right) = -\sin(x^2)\cdot 2x = -2x\sin(x^2)$

ex: $\frac{d}{dx}(\tan x) = \frac{d}{dx}\left(\frac{\sin x}{\cos x}\right) = \frac{\cos x\cdot\cos x - \sin x(-\sin x)}{(\cos x)^2}$

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



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

$= \sec^2 x$

$\frac{d}{dx}(\sin f(\theta)) = \cos(f(\theta))\cdot f'(\theta)$

ex: $g(\theta) = \sin(\tan\theta)$

$g'(\theta) = \cos(\tan\theta)\cdot\sec^2\theta$

ex: $z = \theta e^{\cos\theta}$

$z' = \underset{1st}{\theta}\underbrace{e^{\cos\theta}(-\sin\theta)}_{\text{der of 2nd}} + \underbrace{e^{\cos\theta}}_{\text{2nd}}\cdot\underbrace{1}_{\text{deriv of }\theta} = e^{\cos\theta}(-\theta\sin\theta + 1)$

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3) $s(\theta) = \cos\theta\sin\theta$ Product Rule

$s'(\theta) = \cos\theta\cdot\cos\theta + \sin\theta\cdot(-\sin\theta)$

$= \cos^2\theta - \sin^2\theta$

7) $R = 10 - 3\cos(\pi x)$ $\qquad \cos(f(x))$

$R' = -3(-\sin(\pi x)) \cdot \pi$

$R' = 3\pi \sin(\pi x)$

9) $f(x) = x^2 \cos x$

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

$= x(-x\sin x + 2\cos x)$

$-x^2 \sin x + 2x\cos x$

17) $f(x) = (1-\cos x)^{1/2}$

$f'(x) = \frac{1}{2}(1-\cos x)^{-1/2} \cdot (\sin x) = \dfrac{\sin x}{2\sqrt{1-\cos x}}$

$\frac{d}{dx}(1-\cos x) = \sin x$

$\frac{d}{dx}\left(\tan(\sin x)\right) = \sec^2(\sin x) \cdot \cos x$

$\frac{d}{dx}\left(\tan(f(x))\right) = \sec^2(f(x)) \cdot f'(x)$

27) $z = \tan(e^{-3\theta})$

$z' = \sec^2(e^{-3\theta}) \cdot e^{-3\theta} \cdot (-3)$

$z' = -3e^{-3\theta} \sec^2(e^{-3\theta})$