WARMUP

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

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

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

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

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

$H(4)=F(G(4))=F(2)=1$

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

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

$H'(4)=F'(2)\cdot G'(4)$

$=5\cdot 6=30$

c) $H'(4)$ if $H(x)=F(x)\cdot G(x)$

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

$=3\cdot 6+2\cdot 7$

$=18+14=32$

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

$H'(4)=\dfrac{G(4)\cdot F'(4)-F(4)\cdot G'(4)}{(G(4))^2}$

$=\dfrac{2\cdot 7-3\cdot 6}{2^2}=\dfrac{14-18}{4}$

$=-1$

Section 3.5 Derivatives of Trig Functions

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

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

$\dfrac{d}{dx}(cf(x))=cf'(x)$

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

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

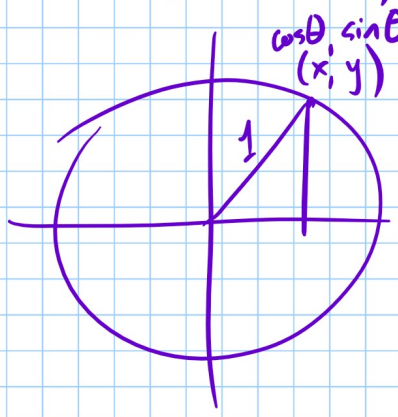
ex: $\dfrac{d}{dx}(\cos^2 x)=\dfrac{d}{dx}((\cos x)^2)=2(\cos x)^1\cdot(-\sin x)$

$=-2\cos x\sin x$

$\cos(f(x))$

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

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



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

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

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

ex: $g(\theta) = \sin\left(\tan\theta\right)$ $\overset{\frac{d}{d\theta}\left(\sin(f(\theta)\right)}{=}$ $\cos\left(\tan\theta\right)\cdot\sec^2\theta$

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

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

$z' = e^{\cos\theta}\left(-\theta\sin\theta + 1\right)$

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

$\cos(f(x))$

$R'(x) = 0 - 3(-\sin(\pi x)) \cdot \pi = 3\pi \sin(\pi x)$

11) $f(x) = e^{\cos x}$

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

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

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

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