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 $H(x)=F(G(x))$

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

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

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

$=5\cdot 6=30$

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

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

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

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

$=G'(3)\cdot F'(4)=8\cdot 7=56$

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

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

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

$=-1$

Section 3.5 Derivatives of Trig Functions

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

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

ex: $\dfrac{d}{dx}(\underbrace{2}_{c}\cdot\underbrace{\sin(3x)}_{f(x)})=\underbrace{2}_{c}\cdot\underbrace{\cos(3x)\cdot 3}_{f'(x)}=6\cos(3x)$

$\dfrac{d}{dx}\left[(3x^2-10)^7\right]$

$=7(3x^2-10)^6\cdot 6x$

$=42x(3x^2-10)^6$

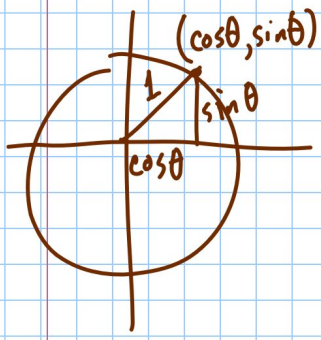
ex: $\dfrac{d}{dx}(\cos^2 x)=\dfrac{d}{dx}\left((\cos x)^2\right)=2(\cos x)^1\cdot(-\sin x)$

$=-2\cos x\cdot\sin x$

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

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

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



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

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

$\frac{d}{dx}\left[\tan x\right] = \sec^2 x$

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

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

ex: $z = \underbrace{\theta}_{1^{st}} \underbrace{e^{\cos\theta}}_{2nd}$

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

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

$\frac{d}{dx}\left[e^{f(x)}\right] = e^{f(x)} \cdot f'(x)$

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

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

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

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

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

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

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