Chain rule examples

math 111
10/4/17

① Evaluate $\frac{d}{dx}\left[(2x+1)^7\right]$

$= 7(2x+1)^6 \cdot 2$ $\quad \left(\frac{d}{du}u^7 = 7u^6 \quad \frac{d}{dx}(2x+1) = 2\right)$

$= \boxed{14(2x+1)^6}$

② Evaluate $\frac{d}{dx}\sec\left(\frac{1}{x}\right)$

$= \sec\left(\frac{1}{x}\right)\tan\left(\frac{1}{x}\right)\cdot\left(-\frac{1}{x^2}\right)$ $\quad \left(\frac{d}{du}\sec u = \sec u \cdot \tan u\right.$

$\left.\frac{d}{dx}\left(\frac{1}{x}\right) = -\frac{1}{x^2}\right)$

$= \boxed{-\sec\left(\frac{1}{x}\right)\tan\left(\frac{1}{x}\right)/x^2}$

③ Evaluate $\frac{d}{dx}\tan\left(\frac{1}{x^2+1}\right)$

$= \sec^2\left(\frac{1}{x^2+1}\right)\cdot\frac{d}{dx}\left(\frac{1}{x^2+1}\right)$ $\quad \left(\frac{d}{du}\tan(u) = \sec^2 u\right)$

$= \boxed{-\sec^2\left(\frac{1}{x^2+1}\right)\cdot\frac{2x}{(x^2+1)^2}}$

④ Evaluate $\frac{d}{dx}\left[(\sin\sqrt{x})^5\right]$

$= 5(\sin(\sqrt{x}))^4 \cdot \frac{d}{dx}\sqrt{x}$

$= \boxed{\frac{5(\sin(\sqrt{x}))^4}{2\sqrt{x}}}$

⑤ Evaluate $(f\circ g)'(2)$, given the following data about f, g, and their derivatives.

x	0	1	2	3
f(x)	10	7	2	-5
f'(x)	(-2)	-4	-6	-8
g(x)	1	0	(0)	2
g'(x)	-2	-1	(1)	3

$(f\circ g)'(2)$

$= f'(g(2))\cdot g'(2)$

$= f'(0)\cdot g'(2)$

$= (-2)\cdot(1) = \boxed{-2}$