AP Calculus | Name________________________Pd.__
Chain Rule (2) | D(1) Day 7

1-12: Find the derivative of the function.

1. $F(x)=\sqrt{1-2x}$

2. $f(x)=\frac{1}{(1+\sec x)^2}$

$f(x)=1(1+\sec x)^{-2}$

$f'(x)=-2(1+\sec x)^{-3}\cdot\frac{d}{dx}[1+\sec x]$

$f'(x)=-2(1+\sec x)^{-3}\cdot\sec x\tan x=\frac{-2\sec x\tan x}{(1+\sec x)^3}$

3. $f(t)=\sin\left(e^t\right)+e^{\sin t}$

4. $y=\cos\left(a^3+x^3\right)$  $a=$ some constant

$y'=-\sin(a^3+x^3)\cdot\frac{d}{dx}[a^3+x^3]$

$y'=-\sin(a^3+x^3)[3x^2]=-3x^2\cdot\sin(a^3+x^3)$

5. $y=xe^{-kx}$  $k=$ some constant

6. $y=a^3+\cos^3 x$  $a=$ some constant

$y=a^3+(\cos x)^3$

$y'=0+3(\cos x)^2\cdot\frac{d}{dx}[\cos x]$

$y'=3\cdot\cos^2 x\cdot(-\sin x)$

$y'=-3\sin x\cdot\cos^2 x$

7. $g(x)=(x^2+1)^3(x^2+2)^6$

8. $h(t)=(t+1)^{\frac{2}{3}}\left(2t^2-1\right)^3$

$h'=(t+1)^{2/3}\cdot d/dt[(2t^2-1)^3]+(2t^2-1)^3\cdot\frac{d}{dt}[(t+1)^{2/3}]$

$h'(t)=(t+1)^{2/3}\cdot 3(2t^2-1)^2\cdot\frac{d}{dt}[2t^2-1]+(2t^2-1)^3\cdot\frac{2}{3}(t+1)^{-1/3}\cdot\frac{d}{dt}[t+1]$

$h'(t)=(t+1)^{2/3}\cdot 3(2t^2-1)^2(4t)+(2t^2-1)^3\,2/3\,(t+1)^{-1/3}(1)$

$h'(t)=\frac{12t(t+1)^{2/3}(2t^2-1)^2\cdot 3(t+1)^{1/3}}{3(t+1)^{1/3}}+\frac{2(2t^2-1)^3}{3(t+1)^{1/3}}$

$h'(t)=\frac{36t(t+1)(2t^2-1)^2+2(2t^2-1)^3}{3(t+1)^{1/3}}$

$=\frac{2(2t-1)^2[18t(t+1)+2t^2-1]}{3(t+1)^{1/3}}=\frac{2(2t-1)^2[20t^2+18t-1]}{3(t-1)^{1/3}}$

9. $F(t)=(3t-1)^4(2t+1)^{-3}$

10. $y=2^{\sin\pi x}$

omit we will do tomorrow :)

11. $y=\sqrt{1+2e^{3x}}$

12. $y=5^{-\frac{1}{x}}$ omit we will do tomorrow

13-16: Find the equation of the tangent line to the curve at the given point. D(1) Day 7

13. $y=(1+2x)^{10}$ $(0,1)$

14. $y=\sqrt{1+x^3}$ $(2,3)$ Point: $(2,3)$

Slope: $y'(2)=$ 2

$y=(1+x^3)^{1/2}$

$y'=\frac{1}{2}(1+x^3)^{-1/2}\cdot\frac{d}{dx}[1+x^3]$ $\boxed{y-3=2(x-2)}$

$y'=\frac{1}{2}(1+x^3)^{-1/2}\cdot 3x^2$

$y'=\frac{3x^2}{2\sqrt{1+x^3}}$ $y'(2)=\frac{3(2)^2}{2\sqrt{1+8}}=\frac{12}{6}=2$

15. $y=\sin(\sin x)$ $(\pi,0)$

16. $y=\sin x+\sin^2 x$ $(0,0)$ Point: $(0,0)$

Slope $y'(0)=1$

$y=\sin x+(\sin x)^2$

$y'=\cos x+2(\sin x)^1\frac{d}{dx}[\sin x]$ $\boxed{y-0=1(x-0)}$

$y'=\cos x+2\sin x\cos x$

$y'(0)=\cos(0)+\cancel{2\sin(0)\cos(0)}$ →0

$y'(0)=1$

17-18: A table of values for f, g, f', and g' is given.

| $x$ | $f(x)$ | $g(x)$ | $f'(x)$ | $g'(x)$ |
|---|---|---|---|---|
| 1 | 3 | 2 | 4 | 6 |
| 2 | 1 | 8 | 5 | 7 |
| 3 | 7 | 2 | 7 | 9 |

17. If $h(x)=f(g(x))$, *find* $h'(1)$

18. If $H(x)=g(f(x))$, *find* $H'(1)$ g(AT)

$H'(x)=g'(f(x))\cdot f'(x)$

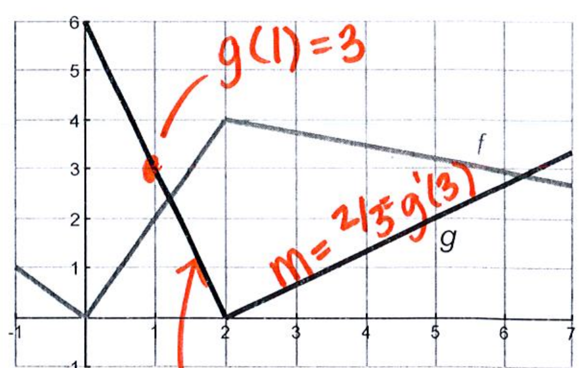
$H'(1)=g'(f(1))\cdot f'(1)$

$g'(3)\cdot 4$

$9\cdot 4=36$

19-22: If f and g are the functions whose graphs are shown. Let $u(x)=f(g(x))$, $v(x)=g(f(x))$, and $w(x)=g(g(x))$. Find each derivative, if it exists. If it does not exist, explain why.

19. $u'(1)$




20. $v'(1)$

21. $w'(1)$ $w(x)=g(g(x))$

$w'(x)=g'(g(x))\cdot\frac{d}{dx}[g(x)]$

$w'(x)=g'[g(x)]\cdot g'(x)$

$w'(1)=g'[g(1)]\cdot g'(1)$

$g'[3](-3)=\frac{2}{3}(-3)=-2$