Calculus

Name________________________

Derivatives Practice: Power, Product, Quotient, and Basic Chain

Differentiate each.

1. $y=(3x^2+1)^4$

$y'=4(3x^2+1)^3(6x)$

$=24x(3x^2+1)^3$

2. $y=3(4-9x)^4$

$y'=12(4-9x)^3(-9)$

$=-108(4-9x)^3$

3. $y=(9-x^2)^{\frac{2}{3}}$

$y'=\frac{2}{3}(9-x^2)^{-1/3}(-2x)$

$=\dfrac{-4x}{3(9-x^2)^{1/3}}$

4. $f(t)=t^3\sin t$

$f'(t)=t^3\cos t+\sin t\cdot 3t^2$

$=t^3\cos t+3t^2\sin t$

$=t^2(t\cos t+3\sin t)$

5. $g(x)=\dfrac{\sin x+x}{\cos x}$

$g'(x)=\dfrac{\cos x(\cos x+1)-(\sin x+x)(-\sin x)}{\cos^2 x}$

$=1$

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

$=\dfrac{\cos x+x\sin x+1}{\cos^2 x}$

6. $\dfrac{d}{d\theta}\left(e^{\tan\theta}\right)$

$=e^{\tan\theta}\cdot\sec^2\theta$

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7. $f(x)=\frac{1}{x-2}$ $=(x-2)^{-1}$

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

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

$s'(t)=-1(t^2+3t-1)^{-2}(2t+3)$

$=\frac{-(2t+3)}{(t^2+3t-1)^2}$

9. $y=e^{x^3-6x}$

$y'=e^{x^3-6x}(3x^2-6)$

$=(3x^2-6)e^{x^3-6x}$

10. $y=\frac{e^x-6}{x^2-6}$

$y'=\frac{(x^2-6)(e^x)-(e^x-6)(2x)}{(x^2-6)^2}$

$=\frac{e^xx^2-6e^x-2xe^x+12x}{(x^2-6)^2}$

11. $g(r)=\sec(3r)$

$g'(r)=\sec(3r)\tan(3r)\cdot 3$

$=3\sec(3r)\tan(3r)$

12. $y=e^{2x}\sin x$

$y'=e^{2x}\cos x+\sin x\cdot 2e^{2x}$

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

$=e^{2x}(\cos x+2\sin x)$