Name: KEY

Period: _____

Analysis Honors
Chain Rule Practice

Use the Chain Rule to evaluate the derivative of each function.

1. $f(x) = \sin(x)$

$f' = \cos x$

2. $g(x) = \cos(x)$

$g' = -\sin x$

3. $h(x) = \sin(3x)$

$h' = 3\cos(3x)$

4. $y = \cos(2x)$

$y' = -2\sin(2x)$

5. $y = \sin^2(x) = (\sin x)^2$

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

6. $g(x) = \cos^2(x) = (\cos x)^2$

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

7. $k(x) = \sin(x^2)$

$k' = 2x \cdot \cos(x^2)$

8. $y = \sin(x^3)$

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

9. $f(x) = (2x+1)^4$

$f' = 2 \cdot 4(2x+1)^3$

10. $y = \sin^9(13x) = [\sin(13x)]^9$

$y' = 13 \cdot \cos(13x) \cdot 9[\sin(13x)]^8$

11. $f(x) = (x^2+3x-7)^{-5}$

$f' = (2x+3) \cdot -5(x^2+3x-7)^{-6}$

12. $y = (\cos(5x+3)^4)^5$

$y' = 5 \cdot 4(5x+3)^3 \cdot -\sin(5x+3)^4 \cdot 5(\cos(5x+3)^4)^4$

13. $f(x) = (x+4)^2$

$f' = 2(x+4)$

14. $f(x) = (x^2 - 7x)^6$

$f' = (2x-7) \cdot 6(x^2-7x)^5$

15. $f(x)=\dfrac{1}{(x^2-9)^3}$ $= (x^2-9)^{-3}$

$f' = -3(x^2-9)^{-4}(2x)$

16. $f(x)=(3\sqrt{x}-2)^4$ $= (3x^{1/2}-2)^4$

$f' = 4(3x^{1/2}-2)^3 \cdot \frac{3}{2}x^{-1/2}$

17. $f(x)=\cos(5x)-\sin(4x)$

$f' = -5\sin(5x) - 4\cos(4x)$

18. $f(x)=\sec(x)$ $= (\cos x)^{-1}$

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

$= \frac{1}{\cos x} \cdot \frac{\sin}{\cos x}$

$= \sec x \cdot \tan x$

19. $f(x)=\sin^3(2x+7)$ $= [\sin(2x+7)]^3$

$f' = 3(\sin(2x+7))^2 \cdot \cos(2x+7) \cdot 2$

20. $f(x)=(x^4+5x-6x^{-1})^{-2}$

$f' = -2(x^4+5x-6x^{-1})^{-3}(4x^3+5+6x^{-2})$

21. $f(x)=\cos(\sin(x))$

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

22. $f(x)=4\cos^2(x^2-3x+1)$ $= 4[\cos(x^2-3x+1)]^2$

$f' = 4 \cdot (2x-3) \cdot -\sin(x^2-3x+1) \cdot 2[\cos(x^2-3x+1)]$

23. $f(x)=\left(\sqrt{x}-\dfrac{1}{\sqrt{x}}\right)^3$ $= (x^{1/2}-x^{-1/2})^3$

$f' = 3(x^{1/2}-x^{-1/2})^2\left(\frac{1}{2}x^{-1/2}+\frac{1}{2}x^{-3/2}\right)$

24. $f(x)=\sqrt{(2x+5)^3}$ $= (2x+5)^{3/2}$

$f' = \frac{3}{2}(2x+5)^{1/2} \cdot 2$

25. $f(x)=\dfrac{1}{(3x^2-7)^4}$ $= (3x^2-7)^{-4}$

$f' = -4(3x^2-7)^{-5} \cdot 6x$

26. $f(x)=\sin(2x+3)^4$

$f' = 2 \cdot 4(2x+3)^3 \cdot \cos(2x+3)^4$