Name_____

PART I: Two-Layer Derivative: *f*(*g*(*x*))

Match each function with its derivative:

$f(x)=\sin^6(x)$

$f(x)=(9-x)^3$

$f(x)=\sin(x^6)$

$f(x)=\cot(3x)$

$f'(x)=3(9-x)^2\cdot -1$

$f'(x)=\cos(x^6)\cdot 6x^5$

$f'(x)=-\csc^2(3x)\cdot 3$

$f'(x)=6\sin^5(x)\cdot\cos(x)$

What is the general (symbolic) rule for differentiating two-layer functions?

$$\frac{d}{dx}f(g(x))=$$

Find the derivatives of the functions below.

1. $f(x)=\cos(9x)$

2. $f(x)=\sec(8x^2)$

3. $f(x)=(17x^4-12)^8$

4. $f(x)=\csc^3 x$

Challenge! Given *f* '(*x*), determine *f* (*x*):

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

$f(x)=$

PART II: Three-Layer Derivative: $f(g(h(x)))$

Match each function with its derivative:

$f(x)=\sqrt{\sec(4x)}$	$f'(x)=5\tan^4(-2x^3-8)\cdot\sec^2(-2x^3-8)\cdot -6x^2$
$f(x)=\csc((4x)^8)$	$f'(x)=-\csc(4x)^8\cot(4x)^8\cdot 8(4x)^7\cdot 4$
$f(x)=\tan^5(-2x^3-8)$	$f'(x)=4\cos^3(2-9x)\cdot -\sin(2-9x)\cdot -9$
$f(x)=\sin(\cos(7x))$	$f'(x)=\cos(\cos(7x))\cdot -\sin(7x)\cdot 7$
$f(x)=\cos^4(2-9x)$	$f'(x)=\frac{1}{2}(\sec(4x))^{-\frac{1}{2}}\cdot\sec(4x)\tan(4x)\cdot 4$

What is the general (symbolic) rule for differentiating three-layer functions?

$$\frac{d}{dx}f(g(h(x)))=$$

Find the derivatives of the functions below.

1. $f(x)=\cos^4 11x$

2. $f(x)=\sqrt[3]{\sec x^2}$

3. $f(x)=\cot(9x-x^2)^{10}$

4. $f(x)=\cos(\csc(x^3))$

Challenge! Given f′(x), determine f(x):

$f'(x)=-\csc^2(4x^3+8x)^5\cdot 5(4x^3+8x)^4\cdot(12x^2+8)$ $\qquad f(x)=$

Write the chain rule out in words: