The Chain Rule solutions Name:____________________

Purpose: To use CAS and a variety of examples to discover the procedure for computing the derivative of a composite function.

Open the Chain Rule document on your handheld and follow the directions.

1. To discover the *Chain Rule*, first practice taking derivatives of a few functions using the handheld. Since each function will soon be an inner and outer function in the derivative of a composite, it will be helpful to keep a catalog of these derivatives in front of you.

Function	**Inner**	**Outer**	$\frac{d}{dx}$**(inner)**	$\frac{d}{dx}$**(outer)**
$\sqrt{1+x^2}$	$1+x^2$	$\sqrt{x}$	$2x$	$\frac{1}{2\sqrt{x}}$
$\sin(2x)$	$2x$	$\sin x$	2	$\cos x$
$(x-1)^3$	$x-1$	x^3	1	$3x^2$
$(3x+2)^4$	$3x+2$	x^4	3	$4x^3$
$\tan(x^2)$	x^2	$\tan x$	$2x$	$\sec^2 x$
$\sin^2 x$	$\sin x$	x^2	$\cos x$	$2x$

2. Use the handheld to compute the following derivatives.

Function	**Derivative**
$\sqrt{1+x^2}$	$\frac{x}{\sqrt{x^2+1}}$
$\sin(2x)$	$2\cos(2x)$
$(x-1)^3$	$3(x-1)^2$
$(3x+2)^4$	$12(3x+2)^3$
$\tan(x^2)$	$2x\sec^2 x^2$
$\sin^2 x$	$2\sin x\cos x$

3. Based on these examples, can you see a pattern? Write out your guess by filling in the right side of the following equation.

$$\frac{d}{dx}\left(f\left(g\left(x\right)\right)\right) = \quad f'\left(g\left(x\right)\right) \bullet g'\left(x\right)$$

4. Try these out (Use your handheld to check your results):

$$\frac{d}{dx}\tan^2\left(3x\right) = \frac{6\sin\left(3x\right)}{\left(\cos\left(3x\right)\right)^3}$$

$$\frac{d}{dx}\sqrt{16-4x^2} = \frac{-2x}{\sqrt{4-x^2}}$$