Circuit Training – CHAIN Rule **Name** _____

Directions: Begin in cell #1. Take the derivative. Search for your answer. Continue in this manner until you complete the circuit. In some cases, you will need to evaluate the derivative, answer a question, or perhaps find the second derivative. Additional paper may be necessary! No technology is needed!

Answer: 2 # __1__ $f(x) = (x^2+7)^5$, $f'(x) = ?$	Answer: $\frac{8}{9}$ # _____ $f(x) = \sin(x^2)$, $f''(x) = ?$
Answer: $\frac{4}{3}$ # _____ $f(x) = \tan^2(3x^2)$, $f'(x) = ?$	Answer: -2 # _____ $f(x) = \csc\left(\frac{x}{3}\right)$, $f'(\pi) = ?$
Answer: $2x\cos(x^2+7)$ # _____ $f(x) = (x^2+7)^{3/2}$, $f'(x) = ?$	Answer: $10x(x^2+7)^4$ # _____ $f(x) = 5\sqrt{x^2+7}$, $f'(x) = ?$
Answer: $\frac{-3x\,sec^2(3x^2)}{\sqrt{(\tan(3x^2))^3}}$ # _____ $g(\theta) = \cos(3\theta+\pi)$, $g'\left(\frac{\pi}{4}\right) = ?$	Answer: $2x\sec(x^2+7)\tan(x^2+7)$ # _____ $f(x) = \sqrt[3]{x^2+7}\cos x$ $f'(x) = ?$
Answer: $4x\sin(x^2)\cos(x^2)$ # _____ $g(x) = 2x\sqrt{x^2+7}$, $g'(x) = ?$	Answer: $\frac{5x}{\sqrt{x^2+7}}$ # _____ $g(x) = \sin(x^2+7)$, $g'(x) = ?$

Answer: $3x\sqrt{x^2+7}$

_____ $y = \sin^2(x^2)$, $y' = ?$

Answer: -4

_____ $g(t) = (t^3-2)^7$, $g'(1) = ?$

Answer: $2\cos(x^2) - 4x^2\sin(x^2)$

_____ For what value of t does $y = \frac{\sqrt{3t-2}}{t}$ have a horizontal tangent?

Answer: $-\csc x(\cot^2 x + \csc^2 x)$

_____ $h(x) = \sec(x^2+7)$, $h'(x) = ?$

Answer: $\frac{\frac{2}{3}x\cos x - 7\sin x - x^2\sin x}{\sqrt[3]{(x^2+7)^2}}$

_____ The functions $f(x)$ and $g(x)$ are differentiable with select values in the table. Let $h(x) = f\big(g(x)\big)$. What is $h'(2)$?

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
-1	2	-4/3	5	0
2	½	5	-1	3
5	0	1.2	π	10

Answer: $12x\tan(3x^2)\sec^2(3x^2)$

_____ The functions $f(x)$ and $g(x)$ are differentiable with select values in the table. Let $p(x) = f(x)\cdot g\big(f(x)\big)$. What is $p'(5)$?

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
2	1/3	π	-4	6
5	2	1/4	0	-6

Answer: $\frac{3\sqrt{2}}{2}$

_____ $r(t) = \frac{3}{(t^2-2t)^2}$, $r'(-1) = ?$

Answer: $-\frac{2}{9}$

_____ $g(x) = \frac{1}{\sqrt{\tan(3x^2)}}$ $g'(x) = ?$

Answer: 21

_____ Given: $g(x) = 3x^2 - 6x$, $h(x) = \sqrt{x}$
If $f(x) = h\big(g(x)\big)$, then $f'(-1) = ?$

Answer: $\frac{4x^2+14}{\sqrt{x^2+7}}$

_____ $y = \frac{\cos x}{\sin^2 x}$, $\frac{dy}{dx} = ?$