

Skill Builder: Topic 3.1 – The Chain Rule (Circuit)

Begin in the first cell marked #1 and find the derivative of each given function. To advance in the circuit, search for your answer and mark that cell #2. Continue in this manner until you complete the circuit. Show all pertinent work. Note: Some of these problems may require some algebraic manipulation either before or after you take the derivative.

# 1	Ans: -4	# ____	Ans: $\frac{8}{9}$
Find $f'(x)$ for $f(x) = (x^2 + 7)^5$.		Find $f'(x)$ for $f(x) = \sin(x^2)$.	
# ____	Ans: $\frac{4}{3}$	# ____	Ans: -2
Find $f'(x)$ for $f(x) = \tan^2(3x^2)$.		Find $f'(\pi)$ for $f(x) = \csc\left(\frac{x}{3}\right)$.	
# ____	Ans: $2x \cos(x^2 + 7)$	# ____	Ans: $10x(x^2 + 7)^4$
Find $f'(x)$ for $f(x) = (x^2 + 7)^{\frac{3}{2}}$.		Find $f'(x)$ for $f(x) = 5\sqrt{x^2 + 7}$.	

$$\text{Ans: } \frac{-3x \sec^2(3x^2)}{\sqrt{(\tan(3x^2))^3}}$$

Find $g'\left(\frac{\pi}{4}\right)$ for $g(\theta) = \cos(3\theta + \pi)$.

$$\text{Ans: } 2x \sec(x^2 + 7) \tan(x^2 + 7)$$

Find $f'(x)$ for $f(x) = \sqrt[3]{x^2 + 7}$.

$$\text{Ans: } 4x \sin(x^2) \cos(x^2)$$

Find $g'(x)$ for $g(x) = 2x\sqrt{x^2 + 7}$.

$$\text{Ans: } \frac{5x}{\sqrt{x^2 + 7}}$$

Find $g'(x)$ for $g(x) = \sin(x^2 + 7)$.

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

Find y' for $y = \sin^2(x^2)$.

$$\text{Ans: } \frac{2x}{3\sqrt[3]{(x^2 + 7)^2}}$$

Find $g'(1)$ for $g(t) = (t^3 - 2)^7$.

Ans: $2x \cos(x^2)$

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

Ans: $-\frac{(2 \cos^2 x + \sin^2 x)}{\sin^3 x}$

Find $h'(x)$ for $h(x) = \sec(x^2 + 7)$.

Ans: 2

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

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
-1	2	$-\frac{4}{3}$	5	0
2	$\frac{1}{2}$	5	-1	3
5	0	1.2	π	10

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

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

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
2	$\frac{1}{3}$	π	-4	6
5	2	$\frac{1}{4}$	0	-6

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

Find $r'(-1)$ for $r(t) = \frac{3}{(t^2 - 2t)^2}$.

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

Find $g'(x)$ for $g(x) = \frac{1}{\sqrt{\tan(3x^2)}}$.

Ans: 21

Given $g(x) = 3x^2 - 6x$, $h(x) = \sqrt{x}$.
If $f(x) = h(g(x))$, then find $f'(-1)$.

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

Find $\frac{dy}{dx}$ for $y = \frac{\cos x}{\sin^2 x}$.