

AP Calculus AB - The Chain Rule - Test

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Name: _____ Class: _____ Date: ____/____/____

This test checks the chain rule for composite functions, including powers, trig, exponential and logarithmic layers (AP Calculus AB, 3.1). It has 8 questions worth 20 points in total. Allow 45 minutes, work without notes, and show all work, since justification earns points on the AP exam.

About this test

- Grade: AP Calculus AB
- Chapter: The Chain Rule
- Standards: AP CALC AB 3.1
- Time: 45 minutes
- Total: 20 points

Question 1 - Power chain [2 pts]

Differentiate $f(x) = (4x - 7)^6$.

Question 2 - Trig chain [2 pts]

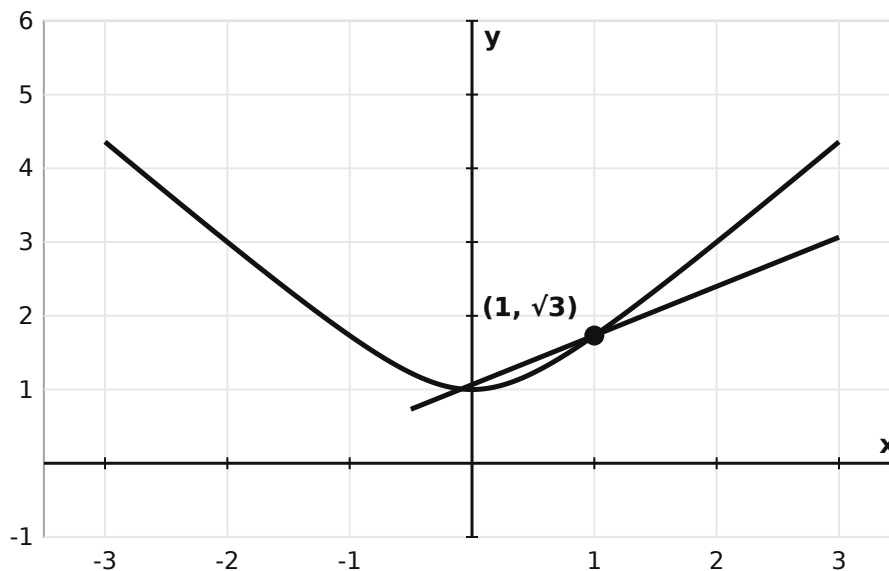
Differentiate $g(x) = \sin(x^3) + \cos(5x)$.

Question 3 - Exponential and log chain [2 pts]

Differentiate $h(x) = e^{x^2 - 3x} + \ln(4x + 1)$.

Question 4 - Three layers [3 pts]

Differentiate $k(x) = \sin^3(x^2 + 1)$.

Question 5 - Tangent line [3 pts]

Graph of $y = \sqrt{2x^2 + 1}$.

Find the tangent line to $y = \sqrt{2x^2 + 1}$ at $x = 1$.

Question 6 - Composite from a table [3 pts]

x	f(x)	f'(x)	g(x)	g'(x)
1			2	-5
2	4	3		
4	7	6		

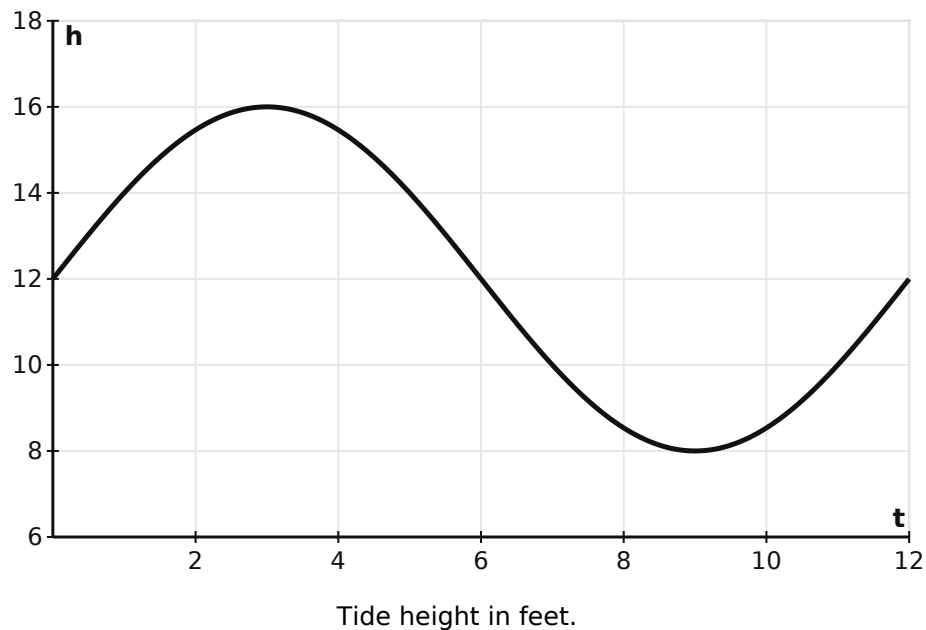
Values of f and g.

Use the table. (a) Find $(f \circ g)'(1)$ where $(f \circ g)(x) = f(g(x))$. (2 points) (b) Find the derivative of $p(x) = [f(x)]^2$ at $x = 4$. (1 point)

Question 7 - Product and chain [2 pts]

Differentiate $p(x) = x e^{3x}$.

Question 8 - Tide height [3 pts]



The height of the tide in feet at a harbor is $h(t) = 12 + 4\sin\left(\frac{\pi t}{6}\right)$ after t hours. (a) Find $h'(t)$. (1 point) (b) Find $h'(0)$ and $h'(3)$. (1 point) (c) Interpret $h'(3)$. (1 point)