

Calculus H  
Ch. 3 #12 Chain Rule

Name \_\_\_\_\_

Part 1: How many times must the chain rule be used to differentiate each function?

1.  $y = \cos(x^2 + 1)$

2.  $y = \cos\left(\left(x^2 + 1\right)^4\right)$

3.  $y = \sqrt{\cos\left(\left(x^2 + 1\right)^4\right)}$

Part 2: Find  $f(g(x))$  and then take the derivative.

1.  $f(u) = u^{3/2}, g(x) = x^4 + 1$

2.  $f(u) = u^3, g(x) = 3x + 5$

3.  $f(u) = u^4 + u, g(x) = \cos x$

4.  $f(u) = \sin u, g(x) = 2x + 1$

5.  $f(u) = 2u + 1, g(x) = \sin x$

6.  $f(u) = u^9, g(x) = x + x^{-1}$

Part 3: Calculate the derivative.

1.  $y = \sqrt{x^3 + 1}$

2.  $y = \cos(x^2)$

3.  $y = (x^3 + 9x + 2)^{-1/3}$

4.  $y = (x^2 + 9)^4$

5.  $y = \sin^5 x$

6.  $y = \sin(1 - 4x)$

7.  $y = (7x - 9)^5$

8.  $y = \sqrt{11x + 4}$

9.  $y = \cos^3(\theta^2)$

10.  $y = \sqrt{1 - t^2}$