

# Calculus Chain Rule Quiz

1)  $f(x) = \cos(3x^2)$

$$f'(x) = -\sin(3x^2)(6x) \Rightarrow \boxed{-6x \sin(3x^2)}$$

2)  $f(x) = (6x^2 + 7x)^4$

$$f'(x) = 4(6x^2 + 7x)^3(12x + 7)$$

3)  $f(x) = \sin(x^3)$

$$f'(x) = 3x^2 \cos(x^3)$$

4)  $f(x) = (3x-5)^5 (5x^2-x+1)^3$

$$f'(x) = (3x-5)^5 [3(5x^2-x+1)^2(10x-1)] + (5x^2-x+1)^3 [5(3x-5)^4(3)]$$

$$= \boxed{3(3x-5)^5(5x^2-x+1)^2(10x-1) + 15(5x^2-x+1)^3(3x-5)^4}$$

5)  $f(x) = \frac{\sin(x)}{1+\cos^2(x)}$

~~$f'(x) = \frac{\cos(x)(1+\cos^2(x)) - \sin(x)(2\cos(x)(-\sin(x)))}{(1+\cos^2(x))^2}$~~

$$f'(x) = 5(1+\cos^2(x))^4 (2\cos(x)(-\sin(x)))$$

$$= \boxed{-10(1+\cos^2(x))^4 \cos(x) \sin(x)}$$

$$6) y = \sin^3(2x+5) \Rightarrow (\sin(2x+5))^3$$

$$y' = 3 (\sin(2x+5))^2 (\cos(2x+5)) (2)$$

$$= \boxed{6 \sin^2(2x+5) \cos(2x+5)}$$

$$7) y = \sin^2(\cos(4x)) \Rightarrow (\sin(\cos(4x)))^2$$

$$y' = 2 (\sin(\cos(4x))) (\cos(\cos(4x)) (-\sin(4x)) (4))$$

$$y' = \boxed{-8 \sin(\cos(4x)) \cos(\cos(4x)) \sin(4x)}$$

$$8) y = \frac{\sin^2 x}{\cos x} \quad (\sin^2 x = 2 \sin x \cos x)$$

$$y' = \frac{\cos x (2 \sin x \cos x) - [\sin^2 x (-\sin x)]}{\cos^2 x}$$

$$y' = \frac{2 \sin x \cos^2 x + \sin^3 x}{\cos^2 x}$$