BC Calculus – Chain Rule Challenge Name:________________

Warming Up:

1. The displacement of a particle on a vibrating string is given by the equation $s(t) = 10 + \frac{1}{4}\sin(10\pi t)$ where s is measured in centimeters and t in seconds. Find the velocity of the particle after t sec.

$s'(t) = \frac{1}{4}\cos(10\pi t) \cdot 10\pi$

2. Find the equation of the tangent line to the function $f(x) = \sqrt{x^2+5}$ at (2, 3).

$f'(x) = \frac{1}{2}(x^2+5)^{-\frac{1}{2}}(2x)$

$f'(2) = \frac{1}{2}\left(\frac{1}{\sqrt{9}}\right)(4) = \frac{2}{3}$

$y - 3 = \frac{2}{3}(x-2)$

Moving Well: Find the derivative

3. $y = \sin\left(\sin\sqrt{x}\right)$

$y' = \cos(\sin\sqrt{x}) \cdot \cos\sqrt{x} \cdot \frac{1}{2}x^{-\frac{1}{2}}$

4. $y = \left(1+\cos^2 x\right)^6$

$y' = 6(1+\cos^2 x)^5 \cdot 2\cos x \cdot (-\sin x)$

In the Zone:

5. A table of values for *f, g, f'*, and *g'* is given:

x	*f(x)*	*g(x)*	*f'(x)*	*g'(x)*
1	3	2	4	6
2	1	8	5	7
3	7	2	7	9

(a) if h(x) = f(g(x)), find h'(1)

$h'(x) = f'(g(x)) \cdot g'(x)$

$h'(1) = f'(g(1)) \cdot g'(1)$

$= f'(2) \cdot g'(1) = 5 \cdot 6 = 30$

(b) if H(x) = g(f(x)), find H'(1)

$H'(x) = g'(f(x)) \cdot f'(x)$

$H'(1) = g'(f(1)) \cdot f'(1) = g'(3) \cdot 4 = 9 \cdot 4 = 36$

6. Use the Chain Rule to prove the derivative of an even function is an odd function.

$\boxed{\text{even function: } f(-x) = f(x)}$

$\frac{d}{dx}(f(x)) = f'(x) \rightarrow f'(x) = -f'(-x)$

$\frac{d}{dx}(f(-x)) = f'(-x) \cdot -1 = -f'(-x)$

$\boxed{-f'(x) = f'(-x)}$

↳ odd function