**Chain Rule Notes: Use as a reference as we go through problems TOGETHER!**

**A. Quantity to a Power**

y = (Quantity)Power

 dy/dx = Power(Quantity)Power – 1 (Derivative of Quantity)

1. y = (7x3 – 4x2 + 5)9

 **y = (Quantity)Power**

 dy/dx = 9(7x3 – 4x2 + 5)8 (21x2 – 8x)

 **dy/dx = Power(Quantity)Power – 1 (Derivative of Quantity)**

Simplify the answer, if possible, by factoring.

 dy/dx = 9**x**(7x3 – 4x2 + 5)8 **(21x – 8)**

**Short Cut Reminder: dy/dx = General Power Rule with quantity as is, times the derivative of the quantity (write this factor first).**

**B. Trig Ratio with a Quantity**

 y = trig ratio (Quantity)

 dy/dx = (Derivative of Quantity)[Derivative of Trig ratio(Quantity)]

 1. y = tan(5x3)

 dy/dx = 15x2[sec2(5x3)]

 **dy/dx = (Derivative of Quantity)[Derivative of Trig Ratio(Quantity)]**

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**Short Cut Reminder: dy/dx = derivative of trig ratio with quantity as is, times the derivative of the quantity (write this factor first).**

**C. Mixing the Two Processes**

 1. **y = Trig ratio(Quantity)Power**

 dy/dx = Power(Quantity)Power – 1(Derivative of Quantity) [Derivative of Trig Ratio(Quantity)Power]

 y = csc(2x5 + 3x)4

 dy/dx = 4(2x5 + 3x)3(10x4 + 3)[–csc(2x5 + 3x)4cot(2x5 + 3x)4]

 dy/dx = **–** 4x3(2x4 +3)**3**(10x4 + 3)[ **csc(2x5 + 3x)4cot(2x5 + 3x)4**]

 

**Be PATIENT!**

4x3(2x4 +3)**3**(10x4 + 3) is just the derivative of the quantity to a power. Notice the x3 factor after the 4. Because I factored x out of a cubed quantity, I actually factored out x3.

[**–** **csc(2x5 + 3x)4cot(2x5 + 3x)4**] is the trig derivative with the quantity as is.

The second situation we have is when the trig ratio is raised to a power.

2. **y = trig ratio power (quantity) = [trig ratio(quantity)]power**

dy/dx = Power[trig ratio(quantity)]power – 1[derivative of quantity(derivative of trig ratio(quantity))]

 y = sin 3(6x2)

 y = [sin(6x2)]3

 dy/dx = 3[sin(6x2)]2 [12x(cos(6x2))]

 **dy/dx = Power[trig ratio(Quantity)]Power – 1[Derivative of quantity(Derivative of Trig ratio(Quantity))]**

 dy/dx = 36xcos(6x2) [sin2(6x2)]

 

**These are notes for you to use as a guide AFTER we go through problems in class. Again, please stop crying – you’re going to damage your iPad. 😊**