Section 2.4 – Chain Rule

Activity 1:

Part 1: Indicate what happens to the size of a fraction if the numerator remains the same but:

Hint: Try out fractions with numbers (E.g.: $\frac{24}{4}$)

1. The denominator is doubled
2. The denominator is halved
3. The denominator is tripled
4. The denominator is multipled by a third

Part 2: Assume that we cover 160 miles in 4 hours.

1. What is the velocity (slope)?
2. How does the velocity (slope) change if it were to take us twice as long to cover 160 miles?
3. How does the velocity (slope) change if it were to take us half as long to cover 160 miles?

Activity 2:

Part 1: If $f\left(x\right)=sin⁡(x)$, find the period of the following

1. $f(x)$
2. $f(2x)$
3. $f(\frac{x}{2})$
4. $f(4x)$
5. $f(\frac{x}{3})$

Part 2: Use derivatives or [*https://www.desmos.com/calculator/kak2bzhnkq*](https://www.desmos.com/calculator/kak2bzhnkq)*\* to fill in the following tables.

|  |  |  |
| --- | --- | --- |
| *x* | *f(x) = sin(x)* | $\frac{d}{dx}\sin(\left(x\right))$ = Slope of tangent line to *f* at x using the derivative |
| 0 |  |  |
| $$\frac{π}{2}$$ |  |  |
| $$π$$ |  |  |
| $$\frac{3π}{2}$$ |  |  |
| $$2π$$ |  |  |

|  |  |  |
| --- | --- | --- |
| *x* | *f(x) = sin(2x)* | $\frac{d}{dx}\sin(\left(2x\right))$ ~ Slope of tangent line to *f* at x using desmos with h=.001 |
| 0 |  |  |
| $$\frac{π}{4}$$ |  |  |
| $$\frac{π}{2}$$ |  |  |
| $$\frac{3π}{4}$$ |  |  |
| $$π$$ |  |  |

Part 3: How does the derivative of the scrunched *sin(2x)* compare to the derivative of unscrunched *sin(x)* at the five fundamental points that define a cycle*?*

Activity 3:

Part 1: If $f\left(x\right)=2^{x}$, find the doubling time of the following

1. $f(x)$
2. $f(2x)$
3. $f(\frac{x}{2})$
4. $f(4x)$
5. $f(\frac{x}{3})$

Part 2: Given the following horizontal stretches (scrunching), use the relationship that doubling and halving time has on the velocity, Fill in the following blanks for $f\left(x\right)=2^{x}$,

1. Velocities for *f(2x) = \_\_\_\_\_\_ \* velocities for unscrunched* f
2. Velocities for $f(\frac{x}{2})=\\_\\_\\_\\_ \* velocities for unscrunched f$
3. Velocities for $f(4x) =\\_\\_\\_\\_\* velocities for unscrunched f$
4. $Velocities for f(\frac{x}{3}) =\\_\\_\\_\\_ \* velocities for unscrunched f$