Math 170  

Change as Area  

Notes

In **Total Change** you learned to use rate of change data to estimate total change. Today’s big idea is:

Every estimate of $\Delta f$ matches an area in the graph of $\frac{df}{dt}$

1. If the estimate of $\Delta f$ uses only **one interval**, then the matching area is a **single rectangle**.
   - The rectangle width is the time interval.
   - The width has units.
   - The rectangle height is the rate.
   - It also has units, and it could be negative.
   - The rectangle area is (height) $\times$ (width), which is the same as (rate) $\times$ (time).
   - The **area has units**. Multiply the rate and time units.
   - In this context, **area can be negative**.

2. If the estimate uses several intervals, then the matching area is a collection of rectangles.
   You must have **one rectangle for each interval**.

3. Estimates of $\Delta f$ could be bigger than, smaller than, or equal to the true value of $\Delta f$.
   Learn how to determine which by looking at the rectangles in a graph of $\frac{df}{dt}$.

4. Demonstrate your understanding of the relationship between an estimate of $\Delta f$ and the matching area:
   - If you are given the rectangles, be able to compute the corresponding estimate.
   - If you are given an estimate, be able to locate, draw and shade the correct collection of rectangles.
   - Compute your own estimate, then draw and shade the matching rectangles.