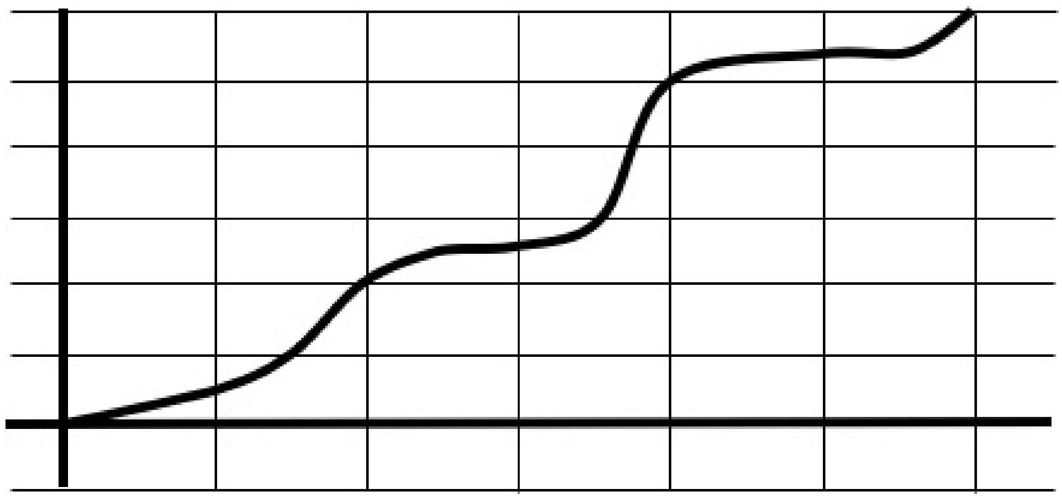
Chewing Gum Riemann Sums – Class Handout



1. Using your gum, represent the area between $f(x)$ and the x-axis from $0 \leq x \leq 5$ with a left-endpoint Riemann sum. Once the placement of your gum has been verified, use a piece of paper to cover the portion of gum that lies below the x-axis, and use the visible portion of the gum to approximate the area between $f(x)$ and the x-axis from $0 \leq x \leq 5$. Is your answer an overestimate or underestimate of the actual area?

2. Using your gum, represent the area between $f(x)$ and the x-axis from $0 \leq x \leq 5$ with a right-endpoint Riemann sum. Once the placement of your gum has been verified, use a piece of paper to cover the portion of gum that lies below the x-axis, and use the visible portion of the gum to approximate the area between $f(x)$ and the x-axis from $0 \leq x \leq 5$. Is your answer an overestimate or underestimate of the actual area?

3. Using your gum, represent the area between $f(x)$ and the x-axis from $0 \leq x \leq 5$ with a midpoint Riemann sum. Once the placement of your gum has been verified, use a piece of paper to cover the portion of gum that lies below the x-axis, and use the visible portion of the gum to approximate the area between $f(x)$ and the x-axis from $0 \leq x \leq 5$.

4. Can you choose *any points* between the left and right endpoints such that the resulting estimate is bigger than your overestimate or smaller than your underestimate? Explain your answer.

5. Using your gum, approximate the area between $f(x)$ and the x-axis from $3 \leq x \leq 6$ with a left-endpoint Riemann sum. Once the placement of your gum has been verified, use a piece of paper to cover the portion of gum that lies below the x-axis, and use the visible portion of the gum to approximate the area between $f(x)$ and the x-axis from $3 \leq x \leq 6$. What do you need to do differently from Problem 1 to solve this problem?

6. Consider a new function, $g(x)$, which is a decreasing function. Which will give an overestimate, a left-endpoint Riemann sum or a right-endpoint Riemann sum? Explain your answer.

7. Consider another new function, $h(x)$, that has both increasing and decreasing regions. Can you state with certainty whether the left-endpoint Riemann sum will be an overestimate or underestimate? Why or why not?