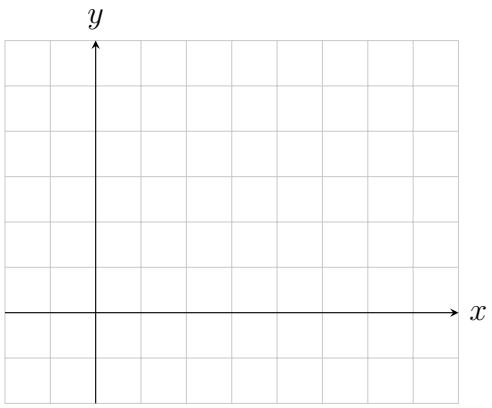
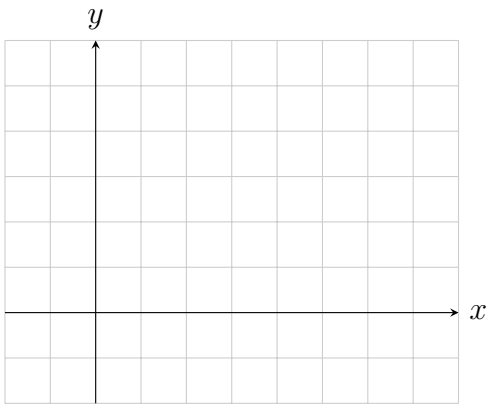
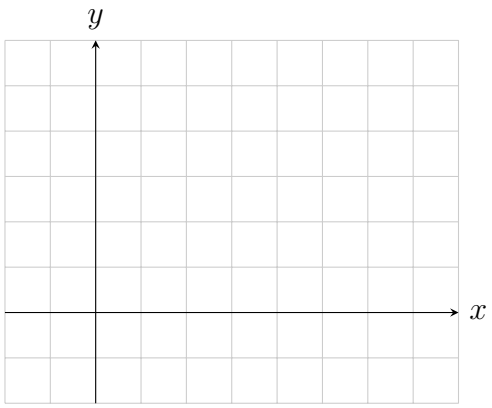
MTH 252 Lesson 5 - The Fundamental Theorem of Calculus I

1. Given the function $f(x) = \frac{1}{2}x + 1$, graph $y = f(x)$ on the first coordinate plane. Then approximate the graph of $y = F(x)$ in the second coordinate plane over the interval $[2, 6]$ where $F(2) = 0$ and using the y-values at $x = 2$, $x = 3$, $x = 4$, $x = 5$, and $x = 6$ on f to determine the slopes of F (remember that f is the derivative of F so the y-values of f are defined to be the slopes of F at a given x-value). Finally, in the third coordinate plane, draw as best you can the function whose y-values match the accumulation of area under $y = f(x)$ over the inverval $[2, 6]$ by finding the area every whole x-value over that interval. How are these graphs related and what can we hypothesize from this work?







2. Evaluate the definite integrals using FTC 1.

a. $\int_{-2}^{2} 5u^4 + u^2 - u \; du$

b. $\int_{8/27}^{1} \frac{10t^{4/3} - 8t^{1/3}}{t^2} \; dt$

c. $\int_{\pi/4}^{5\pi/8} \cos(2x) \; dx$

d. $\int_{2}^{6} x + \frac{1}{x} \; dx$

3. Write the integral as a sum of integrals without absolute values and evaluate.

$\int_{0}^{5} |3 - x| \; dx$

4. Evaluate the integral in terms of the constants.

$\int_{b}^{b^2} \frac{dx}{x}$