Module II, Course Activity 1: Antiderivatives and the First FTC
Synthesis Questions

Name: _____

Procedure: Complete the following synthesis questions. Attach any extra pages of work, explanations, and answers.

Using the (First) Fundamental Theorem of Calculus:

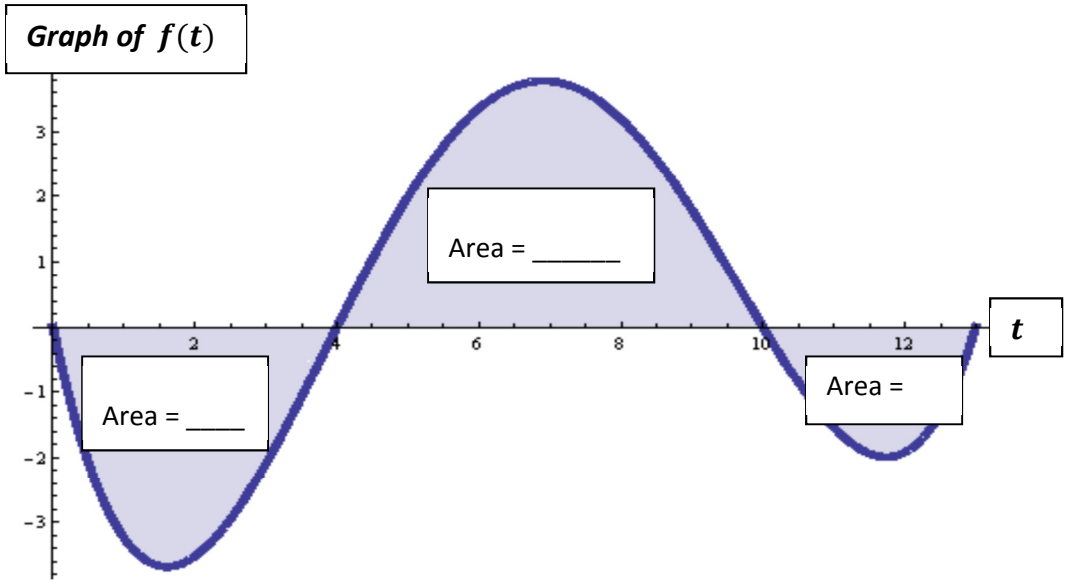
Numerical Problems:

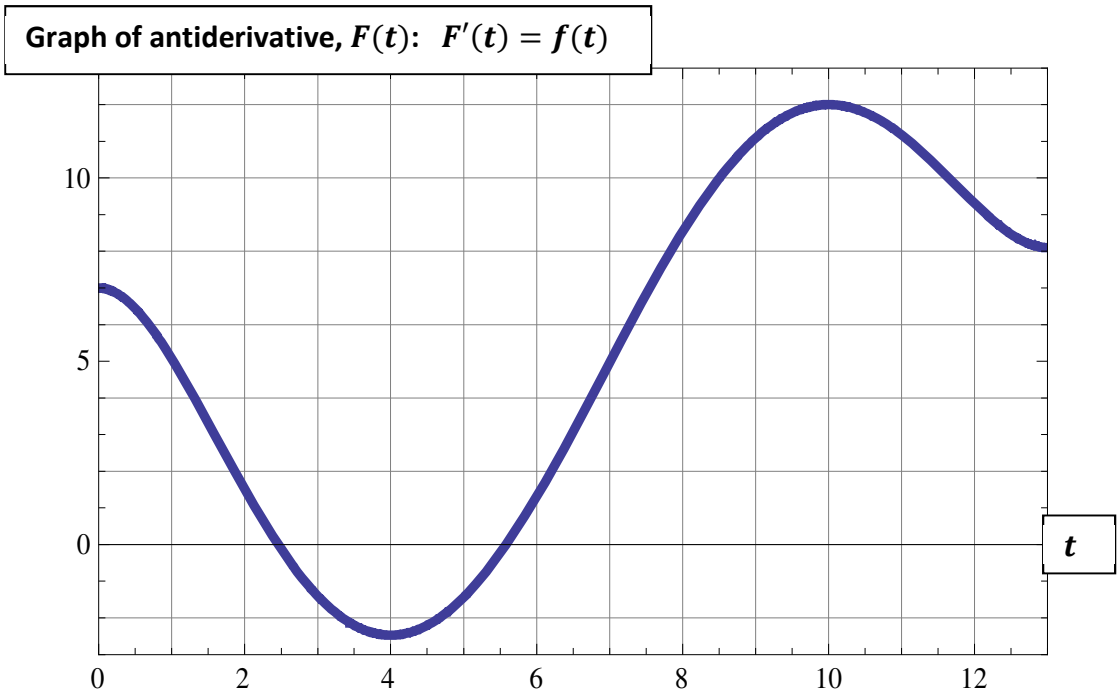
1. Some values for a continuous function $g(x)$ are given in the second row of the table below. $G(x)$ is an antiderivative of $g(x)$. The initial value for $G(x)$ is given. Compute approximate values for $G(x)$ to fill in the rest of the third row of the table below. Show all of your computations and indicate how the (First) Fundamental Theorem of Calculus is being used.

x	0	4	8	12	16
$g(x)$	3	6	7	5	2
$G(x)$	11				

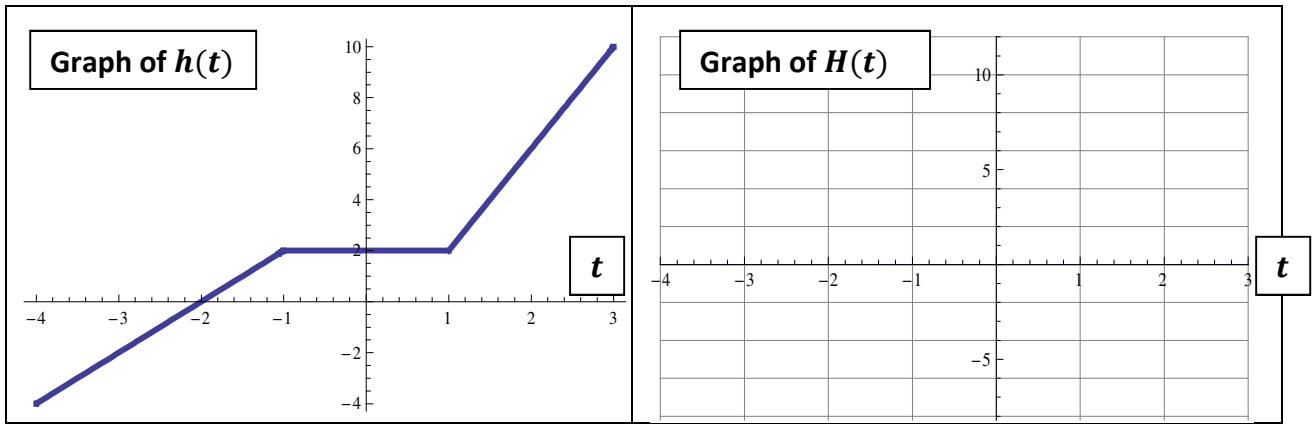
Graphical Problems: Use the (First) Fundamental Theorem of Calculus to answer the following graphical questions as accurately as possible.

2. Consider the graphs below. On top is the graph of a function $f(t)$ and below that, one of its antiderivatives, $F(t)$, is graphed. Fill in the missing areas of the shaded regions.

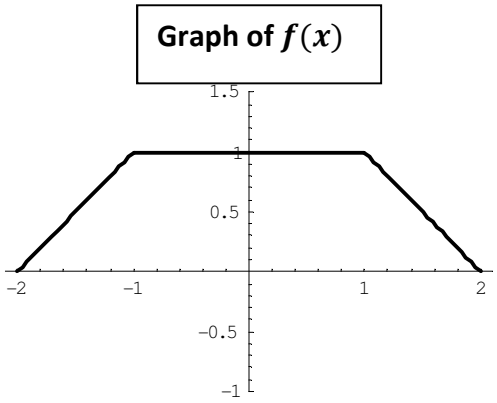




3. The graph of a function, $h(t)$, is given on the left below. Sketch an accurate graph of the antiderivative, $H(t)$, $(H'(t) = h(t))$, with $H(-4) = -2$. Indicate specific values for $H(t)$ on your graph at each integer value of t , by locating those points correctly on the grid, and/or writing the ordered pairs on the graph.



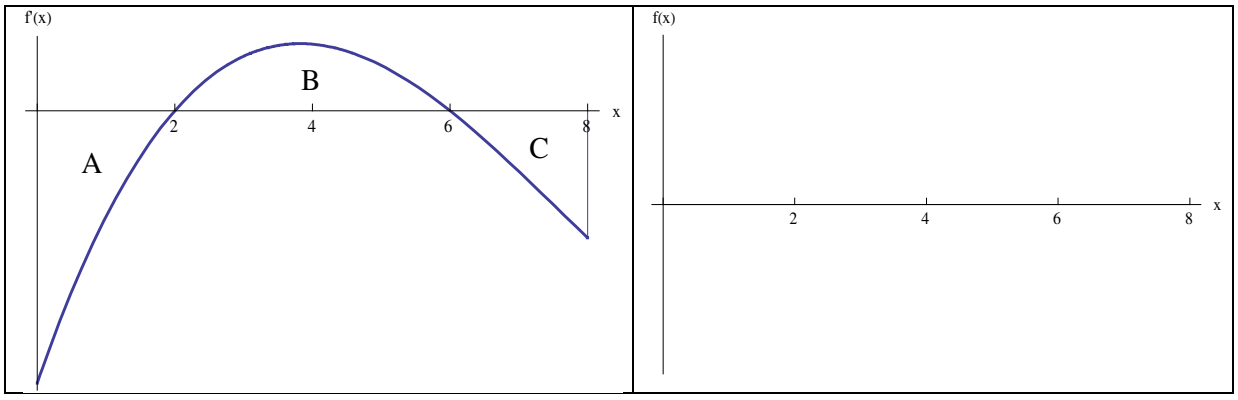
4. Consider the graph of a function $f(x)$ given below:



a. If $F(x)$ is an antiderivative of $f(x)$ and $F(-2) = 0$, compute $F(0)$.

b. If $F(x)$ is an antiderivative of $f(x)$ and $F(-1) = -2$, compute $F(2)$.

5. The graph of a derivative function, $f'(x)$, is shown on the left below.



   a. Sketch a possible graph of the function $f(x)$ on the blank axes to the right above.

   b. If the areas of the regions labeled in the graph of $f'(x)$ are: area of region A = 5, area of region B = 4, and area of region C = 3, and if $f(0) = 8$, then find the following values of $f(x)$:

   $f(2) =$ _____ $f(6) =$ _____ $f(8) =$ _____

6. The family of all antiderivatives of a function, $f(x)$, is called the ***indefinite integral*** of f and is dentoed by $\int f(x)dx$. Find the following indefinite integrals:

   a. $\int (4x^2 - 17x + 2\sqrt{x})\ dx$ =

   b. $\int \sin(4x)\ dx$ =

   c. $\int e^{3x}\ dx$ =

   d. $\int \frac{4}{x}\ dx$ =

7. Describe the difference between the *definite integral*, $\int_2^5 3x^5\ dx$ and the *indefinite integral*, $\int 3x^5\ dx$.