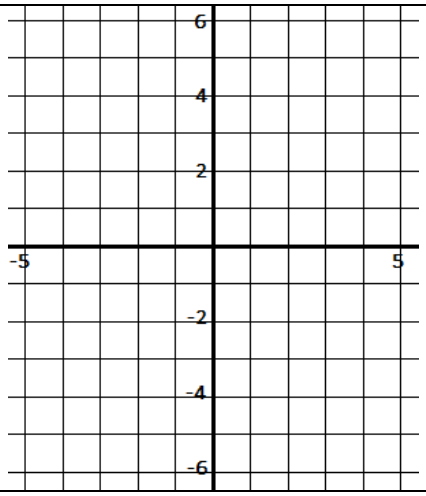
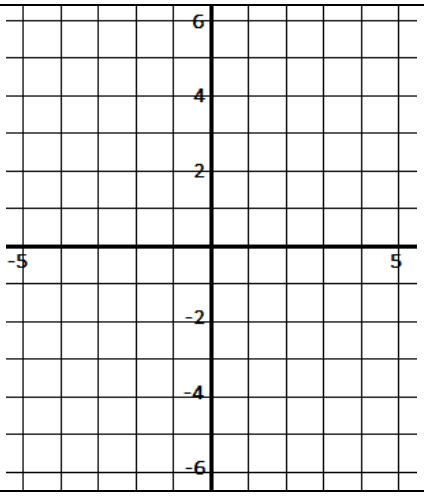
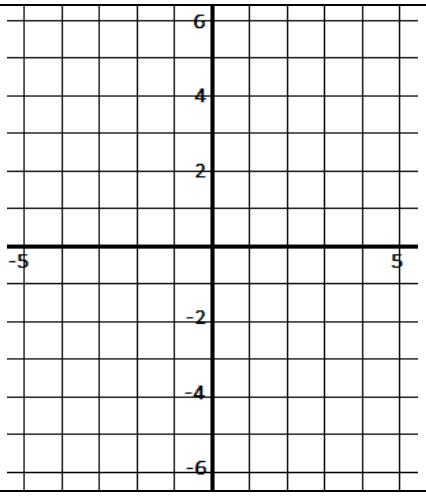
Ch 6 Building Area Functions - part I & part II

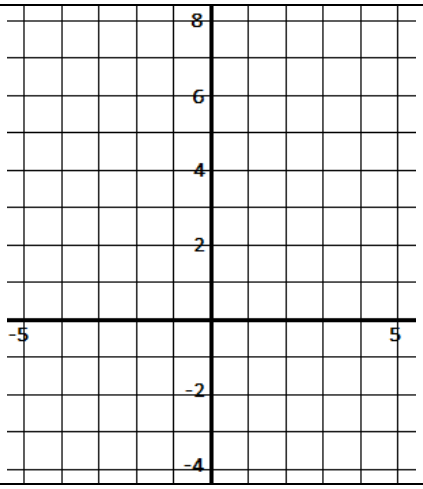
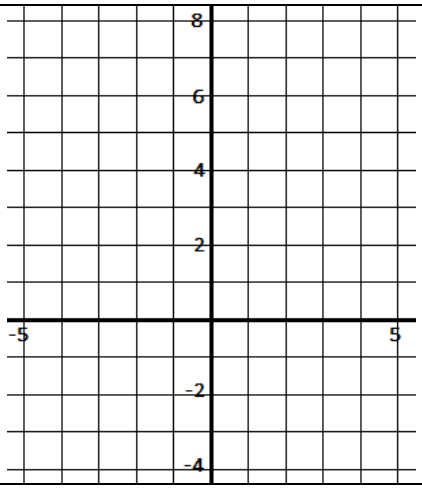
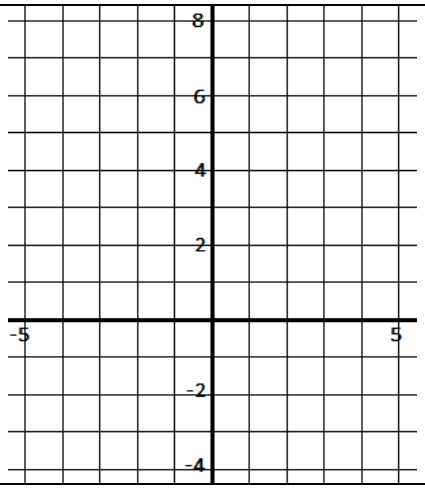
- Graph $f(t)$ on the coordinate grid & identify $f(a)$ at the lower limit $x = a$.
- Shade the region indicated by the integral and use geometry to find a formula for the area bounded by the function, the x-axis and the limits of integration.
- Simplify the function to a standard form polynomial: $y = a_0x^n + a_1x^{n-1} + \ldots + a_{n-2}x^2 + a_{n-1}x^1 + a_n$
- Use a colored pencil to shade the area corresponding to x=0.
- Complete the table of values for the area function, $A(x)$. Does the table model the geometric area shown on the graph?

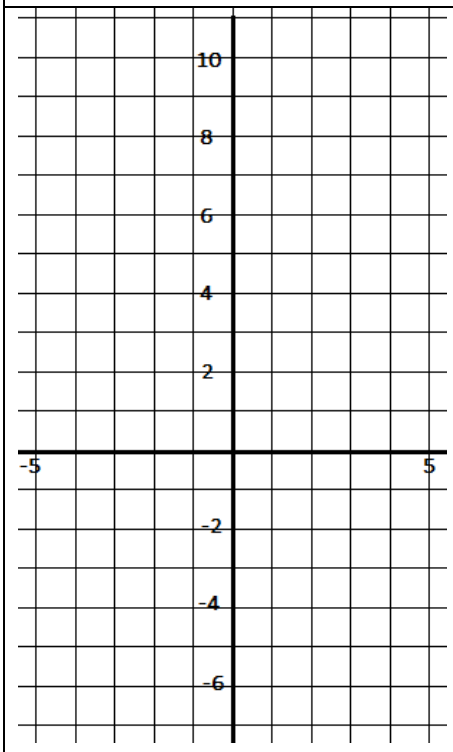
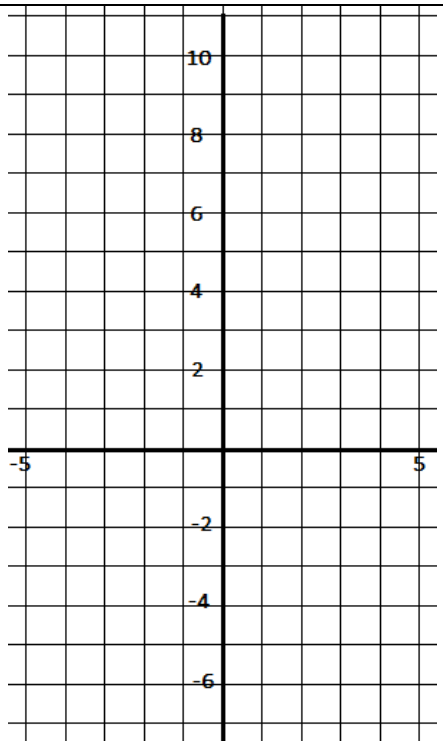
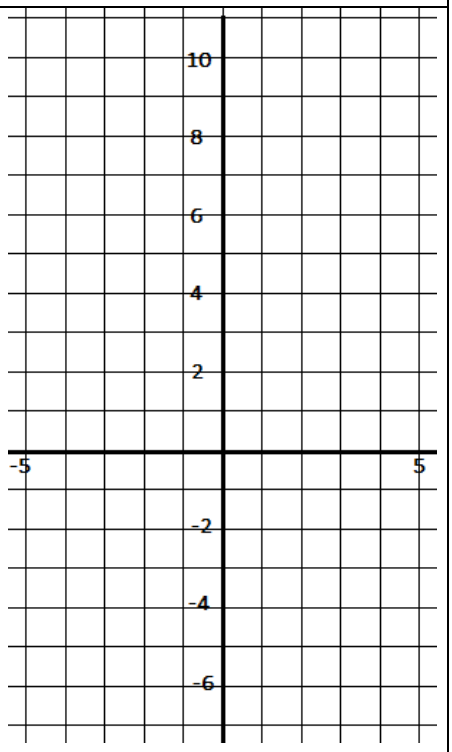
1a)	1b)	1c)
$f(t) = 3 \ on \ [0, x]$ $A(x) = \int_0^x 3dt$	$f(t) = 3 \ on \ [2, x]$ $A(x) = \int_2^x 3dt$	$f(t) = 3 \ on \ [-1, x]$ $A(x) = \int_{-1}^x 3dt$
		
$A(x) =$	$A(x) =$	$A(x) =$
Table x: -3, -2, -1, 0, 1, 2, 3 A(x):	Table x: -1, 0, 1, 2, 3, 4, 5 A(x):	Table x: -4, -3, -2, -1, 0, 1, 2 A(x):
Anti-Derivative		

Looking for Patterns & Making Conjectures:

- How is the y-intercept of the $A(x)$ equation and the table related to an area on the graph?
- What is the relationship between the Area function, $A(x)$ and the original function, $f(t)$?
- How are the area functions in (a), (b) & (c) of this set related to each other?

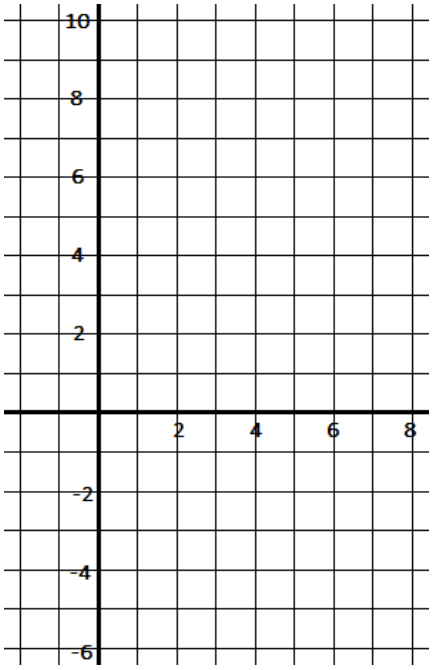
Complete the next three sets of the graphs and tables. After completing each set return to answer these "Making Conjectures:" questions.

$f(t)=t$ on $[0,x]$	$f(t)=t$ on $[2,x]$	$f(t)=t$ on $[-3,x]$
2a) $A(x)=\int_0^x tdt$	2b) $A(x)=\int_2^x tdt$	2c) $A(x)=\int_{-3}^x tdt$
		
$A(x)=$	$A(x)=$	$A(x)=$
Table	Table	Table
x | -3 | -2 | -1 | 0 | 1 | 2 | 3 A(x) |	X | -3 | -2 | -1 | 0 | 1 | 2 | 3 A(x) |	x | -3 | -2 | -1 | 0 | 1 | 2 | 3 A(x) |
Anti-Derivative		

$f(t)=2t+3 \ on \ [0,x]$ 3a) $A(x)=\int_0^x 2t+3dt$	$f(t)=2t+3 \ on \ [1,x]$ 3b) $A(x)=\int_1^x 2t+3dt$	$f(t)=2t+3 \ on \ [-1,x]$ 3c) $A(x)=\int_{-1}^x 2t+3dt$
		
$A(x)=$	$A(x)=$	$A(x)=$
x | -3 | -2 | -1 | 0 | 1 | 2 | 3 A(x) |	x | -3 | -2 | -1 | 0 | 1 | 2 | 3 A(x) |	x | -3 | -2 | -1 | 0 | 1 | 2 | 3 A(x) |
Anti-Derivative		

4a) $f(t)=6-2t \ \ on \ [0,x]$

$$A(x)=\int_0^x 6-2t\,dt$$



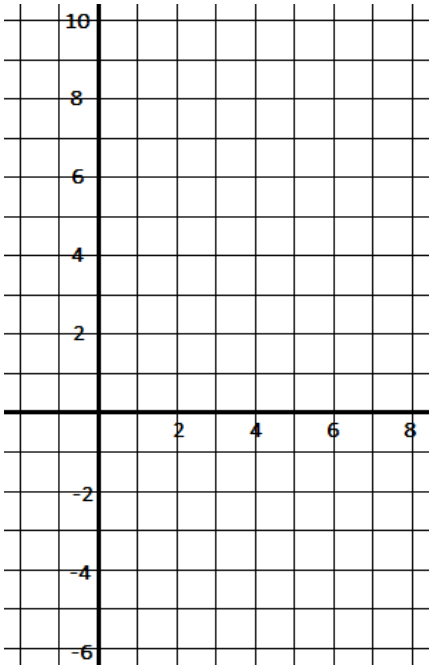
$A(x)=$

x	0	1	2	3	4	5	6
A(x)							

Anti-Derivative

4b) $f(t)=6-2t \ \ on \ [1,x]$

$$A(x)=\int_1^x 6-2t\,dt$$

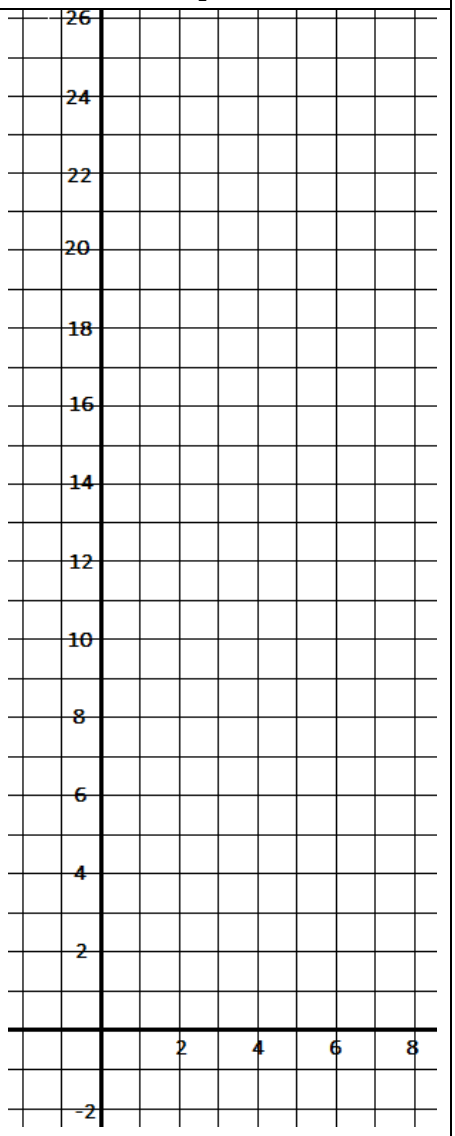


$A(x)=$

x	0	1	2	3	4	5	6
A(x)							

4c) $f(t)=6-2t \ \ on \ [-2,x]$

$$A(x)=\int_{-2}^x 6-2t\,dt$$



$A(x)=$

x	0	1	2	3	4	5	6
A(x)							

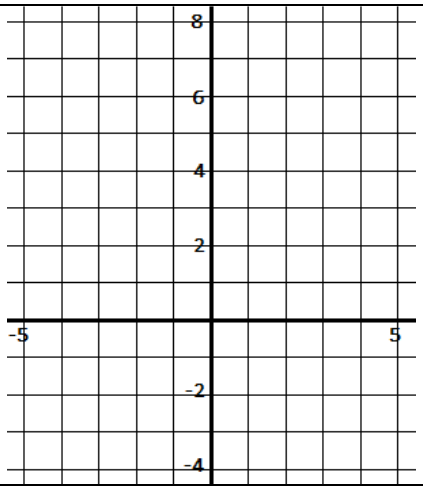
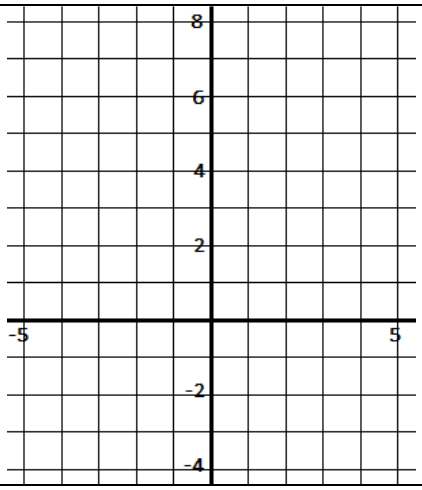
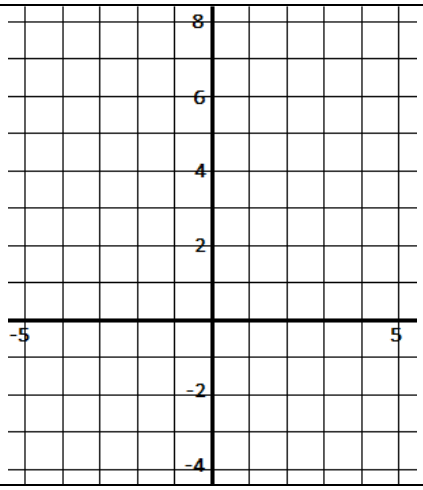
Ch 6 Building Area Functions - part III

We have now seen how to build area functions by:

- Graphing and using geometry to write an area function
- Using a table to record geometric area on the graph and making sure the area function models the data in the table.
- Find the ANTI-DERIVATIVE of $f(t)$, call this $F(x)$ and then evaluate from $x=a$ *to* $x=b$ according to the following:

$$A(x)=\int_a^b f(t)=F(t)\Big|_a^b=F(b)-F(a)$$

Graph the three functions, $f(t)$, on the grids provided.

$f(t)=4$	$f(t)=2t$	$f(t)=4-2t$
		

Use the graphs above to determine an area function for each integral below. Note the changes in the lower limits of each integral.

$A(x)=\int_0^x (4)\,dt$	$A(x)=\int_0^x (2t)\,dt$	$A(x)=\int_0^x (4-2t)\,dt$
Build area function from graph		
Table x | -2 | -1 | 0 | 1 | 2 A(x) |	Table x | -2 | -1 | 0 | 1 | 2 A(x) |	Table x | -2 | -1 | 0 | 1 | 2 A(x) |
Find Anti-Derivative		

$A(x)=\int_{-2}^{x}(4)\,dt$	$A(x)=\int_{-2}^{x}(2t)\,dt$	$A(x)=\int_{-2}^{x}(4-2t)\,dt$
Build area function from graph		
Table x: -4, -2, 0, 1, 3 A(x):	Table x: -4, -2, 0, 1, 3 A(x):	Table x: -4, -2, 0, 1, 3 A(x):
Find Anti-Derivative		

$A(x)=\int_{3}^{x}(4)\,dt$	$A(x)=\int_{3}^{x}(2t)\,dt$	$A(x)=\int_{3}^{x}(4-2t)\,dt$
Build area function from graph		
Table x: -2, 0, 3, 5, 8 A(x):	Table x: -2, 0, 3, 5, 8 A(x):	Table x: -2, 0, 3, 5, 8 A(x):
Find Anti-Derivative		