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Finding the Signed Area Under a Graph By Two Different Methods

2012 - 2013 Fall Semester MATH 1350 (Barsamian) Class Drill
(using concepts from Sections 6-4 and 6-5)

Let $f(x) = 3x - 6$.

(a) Draw the graph of f for $0 \leq x \leq 6$. Make your graph large and neat. Find the coordinates of the x-intercept on the graph and label that.

(b) On your graph, shade the region between the graph of f and the x-axis from $x = 1$ to $x = 5$.

(c) Find the area of the shaded region. (The unsigned area.) It should be the sum of the positive numbers that are the areas of the two triangles.

(d) Using the known areas of the two triangles, find the signed area of the shaded region. That is, using geometry, find the value of

$$A = \int_{x=1}^{x=5} f(x)dx = \int_{x=1}^{x=5} 3x - 6dx$$

(e) Use the antiderivative formulas to find an antiderivative $F(x)$ for $f(x)$. That is, use the antiderivative formulas to find

$$F(x) = \int f(x)dx = \int 3x - 6dx$$

(f) Check: Does $f'(x) = f(x)$? If not, then go back to step (e) and check your work.

(g) Using the function $F(x)$ that you found, compute $F(5) - F(1)$.

(h) Does your answer to question (d) match your answer to question (g)? That is, does $A = F(5) - F(1)$? That is, is the following equation true?

$$\int_{x=1}^{x=5} 3x - 6dx = F(5) - F(1)$$