

1. Suppose that $H(x) = \int_2^x h(t) dt$. Evaluate each of the following expressions in terms of H . Be sure to show your steps.

(a) $\int_2^4 h(u) du$

(b) $\int_3^2 h(x) dx$

(c) $\int_3^4 h(t) dt$

2. Suppose that $F(x) = \int_c^x f(t) dt$, where a , b , and c are constants. Evaluate each of the following expressions in terms of F . Be sure to show your steps.

(a) $\int_c^b f(u) du$

(b) $\int_a^c f(x) dx$

(c) $\int_a^b f(t) dt$

3. What is the relationship between $F(x)$ and $f(x)$ in the previous problem? Complete these two sentences:

$f(x)$ is the _____ of $F(x)$.

$F(x)$ is an _____ of $f(x)$.

Why does the second sentence read “an” and not “the”?

4. Consider $N = \int_0^{\pi/2} \cos x dx$.

(a) Using the previous two questions, explain in detail *how* to evaluate N .

(b) Explain in detail *why* your method works.

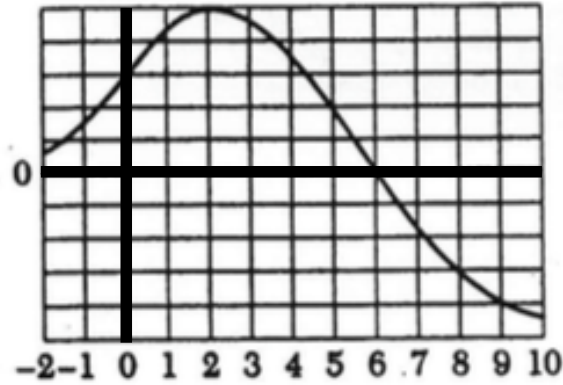
5. Evaluate $A'(x)$ when:

(a) $A(x) = \int_{x^2}^3 \sin(t) dt$

(b) $A(x) = \int_x^{x^2} \ln(t^4) dt$

6. Let $A_f(x) = \int_0^x f(t) dt$ where $f(x)$ is the function in the graph.

Answer each subquestion using the *Fundamental Theorem of Calculus*. [The word *area* cannot be used in any of your explanations.]



- Which is larger: $A_f(1)$ or $A_f(5)$? Justify your answer.
- Which is larger: $A_f(7)$ or $A_f(10)$? Justify your answer.
- Which is larger: $A_f(-2)$ or $A_f(-1)$? Justify your answer.
- Where is $A_f(x)$ increasing?
- Explain why $A_f(x)$ has a stationary point at $x = 6$. Is this a local minimum or a local maximum?
- Let $F(x) = \int_{-2}^x f(t) dt$. Explain why $A_f(x) = F(x) + C$ where C is a negative constant.
- The five numbers $A_f(4) - A_f(3)$, $A_f(5) - A_f(4)$, $A_f(6) - A_f(5)$, $A_f(7) - A_f(6)$, and $A_f(8) - A_f(7)$ can each be interpreted as the slope of a secant line of $A_f(x)$. Explain.
- Explain how to use the graph of $f(x)$ to determine the concavity of $A_f(x)$ on the interval $[3, 8]$.
- Rank the five numbers 0 , $A_f(-1) - A_f(-2)$, $A_f(0) - A_f(-1)$, $A_f(1) - A_f(0)$, and $A_f(2) - A_f(1)$ in increasing order. Explain your reasoning.