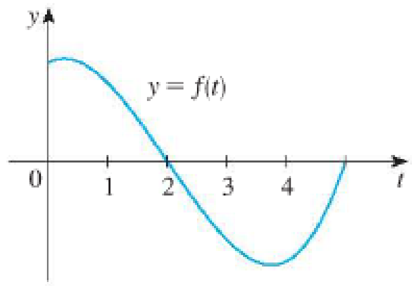
Turn in the following problems:

1. If $\int_1^5 f(x)\,dx = 12$ and $\int_4^5 f(x)\,dx = 3.6$, find $\int_1^4 f(x)\,dx$

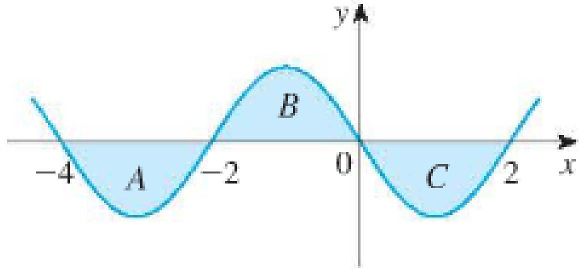
2. If $F(x) = \int_2^x f(t)\,dt$, where f is the function whose graph is given, which of the following values is the largest? Explain your reasoning.

   (a) $F(0)$
   (b) $F(1)$
   (c) $F(2)$
   (d) $F(3)$
   (e) $F(4)$



3. Each of the regions A, B, and C bounded by the graph of f and the x-axis has area 3. Find the value of

$$\int_{-4}^{2} [f(x) + 2x + 5]\,dx$$



4. Consider the following mathematical statements. Determine if the statements are always true, sometimes true, or never true.

   (a) If $f(x)$ is a function, then $\int_1^3 f(x)\,dx$ is the area between the graph of f and the x-axis on $1 \le x \le 3$.

   (b) If $f(x)$ is a continuous function, then $\int_0^2 f(x)\,dx \le \int_0^3 f(x)\,dx$.

   (c) On the interval $a \le t \le b$, the integral of the velocity is the total distance traveled from $t = a$ to $t = b$.

   (d) For all n, $\int x^n\,dx = \frac{x^{n+1}}{n+1} + c$.

   In mathematics, we consider a statement to be false if we can find any examples where the statement is not true. We refer to these examples as counterexamples. Note that a counterexample is an example for which the "if" part of the statement is true, but the "then" part of the statement is false.

   With this in mind, now determine if the above statements are true or false. If the statement is true, give a brief explanation of why it is true. If the statement is false, give a counterexample. Be sure to explain why your counterexample shows the statement to be false.

5. Use geometry to compute the value of the following integrals (this is not asking about total area). Be sure to provide a graph of the function and explain how you used geometry to compute the value of the integral.

   (a) $\int_{-2}^{2} e\,dx$

   (b) $\int_{-4}^{0} \sqrt{16 - x^2}\,dx$

   (c) $\int_{-1} 35 - 2x\,dx$

6. A fellow calculus enthusiast was working through some practice problems. They come to you asking if the following problem is correct:

$$\int \frac{3x^2 + 1}{2x}\,dx = \frac{x^3 + x}{x^2} + c$$

   Determine if they are correct. Explain how you know if they are correct without integrating the function (i.e. find another method using calculus).