1. The speed \( v \) of a car is measured every two seconds for 10 seconds, and the results tabulated below:

\[
\begin{array}{c|cccccc}
 t & 0 & 2 & 4 & 6 & 8 & 10 \\
v(t) & 0 & 4 & 9 & 10 & 11 & 15 \\
\end{array}
\]

(a) Construct an upper and lower estimate for the distance the car has travelled during this time.

(b) How could you improve these estimates?

2. In the following diagram, the indicated areas \( A \), \( B \) and \( C \) represent the area enclosed by the graph of the function \( f(x) \), the \( x \)-axis and the lines \( x = a \) and \( x = b \).

Express \( \int_a^b f(x) \, dx \) in terms of \( A \), \( B \) and \( C \).

3. For each of the following functions, find an estimate of the integral of the function between
Suppose you are given the following facts about the integrals of the functions \( f(x) \) and \( g(x) \):
\[
\int_{0}^{10} f(x) \, dx = 5, \quad \int_{0}^{5} f(x) \, dx = -1, \quad \int_{0}^{10} g(x) \, dx = -3, \quad \int_{0}^{5} 2g(x) \, dx = 6.
\]
Calculate the following:

(a) \( \int_{5}^{10} f(x) \, dx \)
(b) \( \int_{0}^{5} g(x) \, dx \)
(c) \( \int_{5}^{10} g(x) + f(x) \, dx \)
(d) \( \int_{0}^{10} 3f(x) - 2g(x) \, dx \)
(e) \( \int_{10}^{0} f(x) \, dx \)

5. The graph of the derivative of two functions are shown below. On the same set of axes, sketch a possible graph for each function.

(a) 
(b) 

6. Find the general anti-derivative of the following functions:
(a) $f(x) = 5$
(b) $f(x) = x^2$
(c) $f(x) = x^3 - 4x^2 + 2x - 1$
(d) $f(x) = \sqrt{x}$
(e) $f(x) = \frac{x^2 - x}{x^2}$

7. Find the general anti-derivative of the following functions:

(a) $f(x) = e^x$
(b) $f(x) = \sin x$
(c) $f(x) = 2 \cos x - \sin x$
(d) $f(x) = x^7 + 2e^x - 4 \sin x$
(e) $f(x) = \frac{1}{x} - x$

8. Find the anti-derivative $F(x)$ of each of the following functions that satisfies $F(0) = 0$:

(a) $f(x) = 6x$
(b) $f(x) = e^x$
(c) $f(x) = x^2 - 4x + \cos x$
(d) $f(x) = x\sqrt{x} - \frac{1}{\sqrt{x}}$

9. Evaluate the following definite integrals:

(a) $\int_0^4 x \, dx$
(b) $\int_{-1}^1 x^2 \, dx$
(c) $\int_{-2}^3 6x^3 - x^2 \, dx$
(d) $\int_0^2 \cos x \, dx$
(e) $\int_0^2 2e^x \, dx$
(f) $\int_{-1}^1 4x^3 \, dx$
(g) $\int_{-1}^0 \frac{x^3 + x + 1}{x^2} \, dx$
(h) $\int_1^{10} \frac{1}{x} \, dx$

10. Calculate the area bound by the $x$-axis and the following quadratic polynomials:

(a) $y = x^2 - 3x + 2$
(b) $y = x^2 + x - 12$
(c) $y = -x^2 + 1$

11. (a) Find the derivative of $F(x) = x \ln x$.
(b) Hence find a formula for the general anti-derivative of $f(x) = \ln x$. 