Homework Set 3: Definite Integrals

Use the properties of integrals to solve.

1. Given that $\int_9^{16} \sqrt{x} \, dx = \frac{74}{3}$, then $\int_9^{16} \sqrt{t} \, dt =$

2. $\int_\pi^0 x^2 \tan x \, dx =$

3. Write as a single integral in the form $\int_a^b f(x) \, dx$:

   $\int_{-5}^1 f(x) \, dx + \int_1^3 f(x) \, dx - \int_{-5}^{-1} f(x) \, dx =$

4. If $\int_2^7 f(x) \, dx = 10$ and $\int_2^5 f(x) \, dx = 4.2$, then $\int_2^7 f(x) \, dx =$

5. If $\int_0^8 f(x) \, dx = 23$ and $\int_0^8 g(x) \, dx = 8$, then $\int_0^8 [2f(x) + 3g(x)] \, dx =$

6. Use the graph of $f(x)$ shown to evaluate the integrals.

   a. $\int_0^3 f(x) \, dx =$

   b. $\int_3^7 f(x) \, dx =$

   c. $\int_0^8 f(x) \, dx =$
Evaluate the integral by interpreting it in terms of area. Draw a graph of the situation (if not given).

7. \( \int_{-3}^{3} \sqrt{9 - x^2} \, dx \)

8. \( \int_{-1}^{3} \left( \frac{3}{2}x - \frac{1}{2} \right) \, dx \)

9. \( \int_{-2}^{1} |x| \, dx \)

Evaluate the integral by using antiderivatives.

10. \( \int_{-1}^{2} x^6 \, dx \)

11. \( \int_{0}^{2} 1 + 2t - 4t^3 \, dt \)
12. \[ \int_0^6 (2u + 1)(5u - 3) \, du \]

13. \[ \int_1^2 \frac{y + 5y^7}{y^3} \, dy \]

14. \[ \int_0^1 x\left(\sqrt[3]{x} + \frac{5}{\sqrt[3]{x}}\right) \, dx \]

15. The area of the region that lies to the right of the y-axis and to the left of the parabola \( x = 4y - 2y^2 \) (the shaded region in the figure) is given by the integral \( \int_0^2 (4y - 2y^2) \, dy \). (Turn your head clockwise and think of the region as lying below the curve \( x = 4y - 2y^2 \) from \( y=0 \) to \( y=2 \).) Find the area of this region.