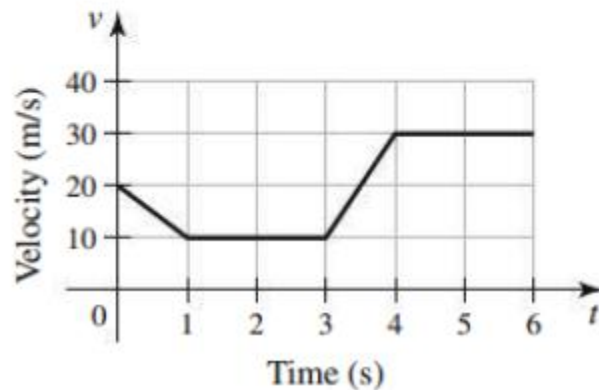


5.1-5.2 Group Activity Problems



- 70. Displacement from a velocity graph** Consider the velocity function for an object moving along a line (see figure).
- Describe the motion of the object over the interval $[0, 6]$.
 - Use geometry to find the displacement of the object between $t = 0$ and $t = 3$.
 - Use geometry to find the displacement of the object between $t = 3$ and $t = 5$.
 - Assuming the velocity remains 30 m/s , for $t \geq 4$, find the function that gives the displacement between $t = 0$ and any time $t \geq 4$.



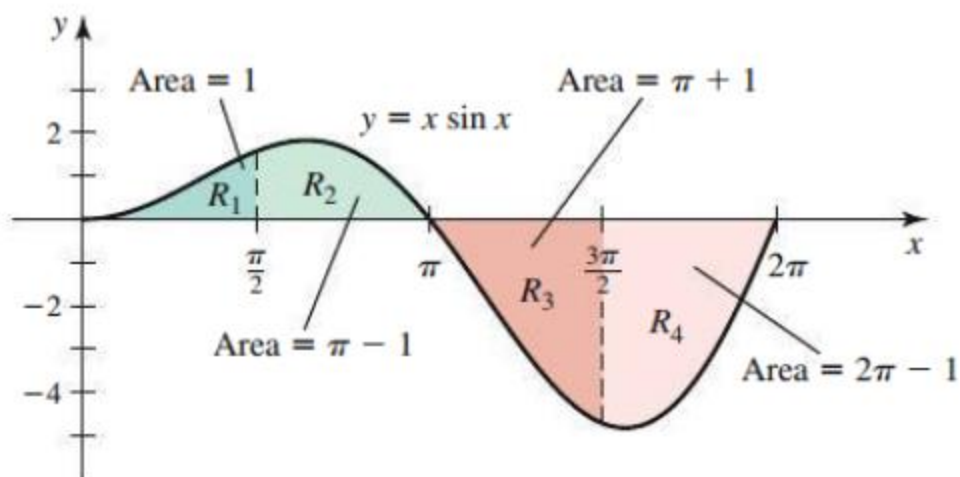
10. Suppose $\int_1^3 f(x) dx = 10$ and $\int_1^3 g(x) dx = -20$. Evaluate $\int_1^3 (2f(x) - 4g(x)) dx$ and $\int_3^1 (2f(x) - 4g(x)) dx$.
15. Use geometry to find a formula for $\int_0^a x dx$, in terms of a constant $a > 0$.
16. If f is continuous on $[a, b]$ and $\int_a^b |f(x)| dx = 0$, what can you conclude about f ?

39–46. Definite integrals Use geometry (not Riemann sums) to evaluate the following definite integrals. Sketch a graph of the integrand, show the region in question, and interpret your result.

44. $\int_{-1}^3 \sqrt{4 - (x - 1)^2} dx$

46. $\int_1^{10} g(x) dx$, where $g(x) = \begin{cases} 4x & \text{if } 0 \leq x \leq 2 \\ -8x + 16 & \text{if } 2 < x \leq 3 \\ -8 & \text{if } x > 3 \end{cases}$

47–50. The accompanying figure shows four regions bounded by the graph of $y = x \sin x$: R_1 , R_2 , R_3 , and R_4 , whose areas are 1, $\pi - 1$, $\pi + 1$, and $2\pi - 1$, respectively. (We verify these results later in the text.) Use this information to evaluate the following integrals.



47. $\int_0^{\pi} x \sin x \, dx$

48. $\int_0^{3\pi/2} x \sin x \, dx$

49. $\int_0^{2\pi} x \sin x \, dx$

50. $\int_{\pi/2}^{2\pi} x \sin x \, dx$

67. Use geometry and properties of integrals to evaluate

$$\int_0^1 (2x + \sqrt{1 - x^2} + 1) \, dx.$$