AP Calculus AB
Section 3.1 Concepts of the Definite Integral
Worksheet 11g: Definite Integrals and Infinite Limits

In Exercises 1 - 4, use the given values of a and b to express the following limits as definite integrals. (Do not evaluate the integrals.)

1. $\lim_{\Delta x_k \to 0} \sum_{k=1}^{n} (x_k)^2 \, \Delta x_k; \; a = -1, \; b = 2$

2. $\lim_{\Delta x_k \to 0} \sum_{k=1}^{n} (x_k)^3 \, \Delta x_k; \; a = 1, \; b = 2$

3. $\lim_{\Delta x_k \to 0} \sum_{k=1}^{n} 4\, x_k (1 - 3\, x_k) \, \Delta x_k; \; a = -3, \; b = 3$

4. $\lim_{\Delta x_k \to 0} \sum_{k=1}^{n} (\sin^2 x_k) \, \Delta x_k; \; a = 0, \; b = \pi/2$

In Exercises 5 - 8, express the integrals as limits of Riemann sums. Do not try to evaluate the integrals.

5. $\int_1^2 2\, x \, dx$

6. $\int_0^1 \frac{x}{x+1} \, dx$

7. $\int_1^2 \sqrt{x}\, dx$

8. $\int_{-\pi/2}^{\pi/2} (1 + \cos x)\, dx$

In Exercises 9 and 10, evaluate the limit over the interval [a, b] by expressing it as a definite integral and applying an appropriate formula from geometry (You may need to graph the function to see which formula from geometry you will need.)

9. $\lim_{\Delta x_k \to 0} \sum_{k=1}^{n} (3\, x_k + 1)\, \Delta x_k;\ a = 0,\ b = 1$

10. $\lim_{\Delta x_k \to 0} \sum_{k=1}^{n} \sqrt{4 - (x_k)^2}\, \Delta x_k;\ a = -2,\ b = 2$