Practice Assessment
Approximating Areas

These **practice problems** are designed to help you **prepare for our course exams** and **assess your understanding** of the course material at the expected level. Aim to complete them **in class, during tutoring, office hours, or on your own**, and try to solve them **without notes or a calculator**, just like on the **actual exams**. Remember, **practice makes perfect**, so don't hesitate to **ask for help** if you get stuck.

Two useful formulas for finite sums are:

- $\displaystyle\sum_{j=1}^{n} j = 1 + 2 + 3 + \ldots + n = \frac{n+1}{n}$
- $\displaystyle\sum_{j=1}^{n} j^2 = 1^2 + 2^2 + 3^2 + \ldots + n^2 = \frac{n(n+1)(2n+1)}{6}$

1. Compute the indicated sum.

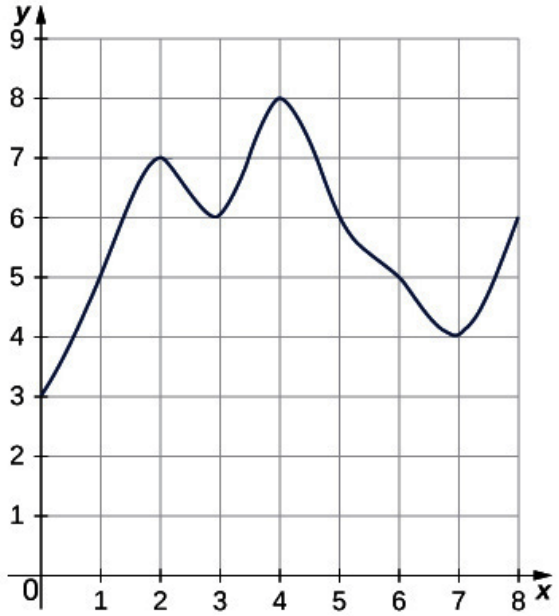
   (a) $\displaystyle\sum_{j=1}^{6}(3j+2)$

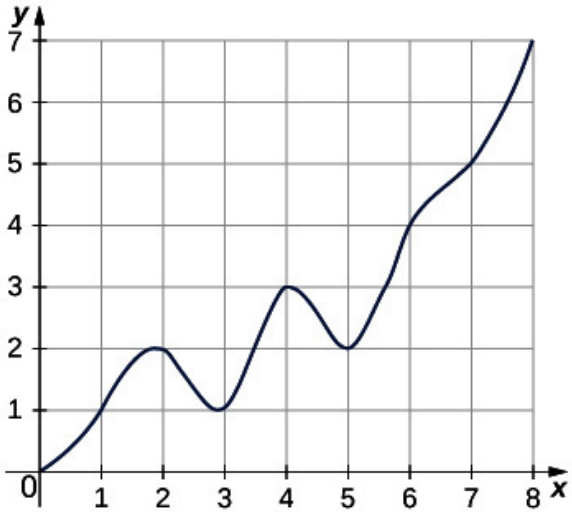
   (b) $\displaystyle\sum_{j=1}^{7}(j-5)$

   (c) $\displaystyle\sum_{j=1}^{5}(j^2-4j+1)$

   (d) $\displaystyle\sum_{j=1}^{5}(2j-5)^2$

2. By reading values from each of the given graphs below, estimate the area under curve by computing the left and right Riemann sums, L_8 and R_8, respectively.





3. (a) Compute the left and right Riemann sums using 4 subintervals, L_4 and R_4, for the function $f(x) = 2x^2 + 3$ on $[0, 4]$

(b) Compute the left and right Riemann sums using 6 subintervals, L_4 and R_4, for the function $f(x) = 6 - x$ on $[0, 3]$

4. Let $f(x) = 3x + 2$.

   (a) Find the left Riemann sum, L_4 for $f(x)$ on $[0, 2]$ with $n = 4$ subintervals.

   (b) Find an expression for the left Riemann sum, L_n for $f(x)$ on $[0, 2]$ with n subintervals.

   (c) Find $\lim_{n\to\infty} L_n$ with L_n obtained from part (b).

   (d) Find an expression for the right Riemann sum, R_n for $f(x)$ on $[0, 2]$ with n subintervals.

   (e) Find $\lim_{n\to\infty} R_n$ with R_n obtained from part (d).

   (f) What can you conclude about the area bounded by the graph of $y = f(x)$, the x-axis, the line $x = 0$ and the line $x = 2$.