5.1 – Approximating the Area Under a Curve

1. Suppose $f(x) = x^2 + 1$. Approximate the area of the region bounded by f and the x-axis over the interval $[0, 2]$ using:

   a. Riemann sum with left endpoints and 4 subintervals

   b. 4 rectangles with midpoints as sample points

c. trapezoids with 4 subintervals

2. Is your answer for 1(a) an overestimate or an underestimate? Justify your answer.

3. Suppose $f(x) = 27 - x^3$. Approximate the area of the region bounded by *f* and the *x*-axis over the interval $[0, 3]$ using:

   a. Riemann sum with right endpoints and 9 subintervals,

   b. 6 rectangles with midpoints as sample points, and

c. trapezoids with 3 subintervals.

4. Is your answer for 2(a) an overestimate or an underestimate? Justify your answer.

5. The following table gives the velocity *v*, measured in ft/s, of an object at various times *t*, measured in seconds.

t	0	5	10	15	20	25	30
$v(t)$	17	21	24	29	32	31	28

Approximate the distance traveled by the object over the interval $0 \le t \le 30$ using:

a. right Riemann sum with 6 subdivisions

b. midpoint Riemann sum with 3 subdivisions

c. trapezoids with 6 subdivisions

6. Use T_3 to approximate $\int_1^2 \left(1-x^2\right) dx$.