Math 10B. Lecture Examples.

Section 7.5. Approximating definite integrals[†]

Example 1   Calculate the Midpoint Rule approximation of $\int_0^1 x^2 \, dx$ corresponding to the partition of $[0,1]$ into five equal subintervals. Draw the curve $y = x^2$ with the rectangles whose areas give the approximation.

Answer: Figure A1. ● [Midpoint Rule approximation] $= 0.33$
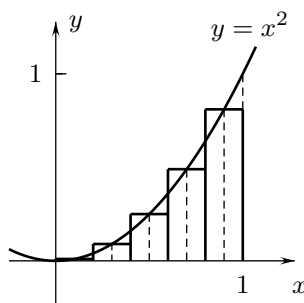
Figure A1

Example 2   Calculate the Trapezoid Rule approximation of $\int_0^{15} g(x) \, dx$ with three subintervals for the function $y = g(x)$ of Figure 1. Draw the trapezoids whose areas give the approximation.
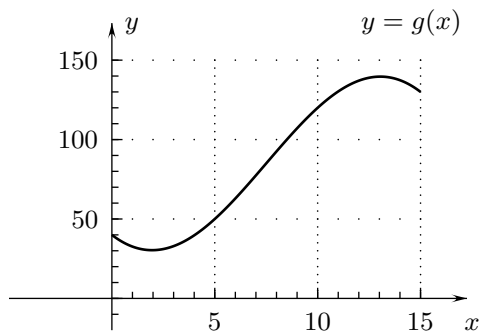
FIGURE 1

Answer: Figure A2 ● [Trapezoid-Rule approximation] $= 1275$
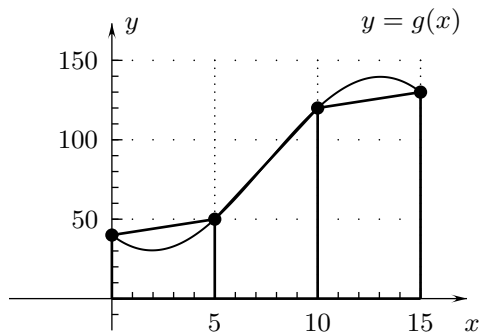
$y = g(x)$

Figure A2

Example 4   **Give the Trapezoid Rule approximation of** $\int_0^{30} x^2\, dx$ **with three subintervals.**

Answer: [Trapezoid Rule approximation] = 9500

Example 5   **The next table gives the rate $r = r(t)$ (million metric tons per year) at which grain was produced in the world at ten-year intervals from 1950 to 1990.**[1] **Use the Trapezoid Rule to estimate the total world grain production from the beginning of 1950 to the beginning of 1990.**

Year	1950	1960	1970	1980	1990
$r(t)$	631	847	1096	1447	1780

Answer: [Total production] $\approx$ 45,955 million metric tons of grain

Interactive Examples

Work the following Interactive Examples on Shenk's web page, http//www.math.ucsd.edu/˜ashenk/:[‡]

Section 6.6: Examples 4a and 4b

---

[1]Data adapted from *Vital Signs*, 1992, p. 25. Source: USDA, *World Grain Database*.

[‡]The chapter and section numbers on Shenk's web site refer to his calculus manuscript and not to the chapters and sections of the textbook for the course.