

Homework Key for Section 1

1. underestimate is 0.7908
2. overestimate is 1.1835
3. Oil leaked from a tank at the rate of $r(t)$ liters per hour. Find the upper and lower estimates for the total oil leaked.

63.2 , 70

4. Write the area under the graph of $f(x) = \sqrt[4]{x}$, $1 \leq x \leq 16$ as a limit. Do NOT evaluate it.

$$\lim_{n \rightarrow \infty} \sum_{i=1}^n \sqrt[4]{1 + (15i/n)} \cdot \frac{15}{n}$$

5. Determine a region whose area is equal to the limit below. Do NOT evaluate it.

$$y = \tan x \text{ from } 0 \text{ to } \pi/4$$

Homework Key for Section 2

- 12.645
- 475, -85
- 124.1644
- Express the following limits as definite integrals:

(a) $\int_2^6 x \ln(1+x^2) dx$

(b) $\int_1^8 \sqrt{2x+x^2} dx$

- Calculate the following integrals **by definition**

(a) 42

(b) $\frac{4}{3}$

- Express $\int_2^6 \frac{x}{1+x^5} dx$ as the limit of a Riemann sum. Do NOT evaluate it.

$$\lim_{n \rightarrow \infty} \sum_{i=1}^n \frac{2+4i/n}{1+(2+4i/n)^5} \cdot \frac{4}{n}$$

- A graph is given below. Calculate the following by interpreting in terms of areas.

(a) 4 (b) 10 (c) -3 (d) 2

- Evaluate $\int_{-2}^2 \sqrt{4-x^2} dx = 2\pi$

Homework Key for Section 3

1. Use (i) the Trapezoidal Rule, and (ii) Simpson's Rule to approximate the following. Round to six decimal places

(a) $\int_1^5 \frac{\cos x}{x} dx$, $n = 8$

(i) -0.495333 (ii) -0.526123

(b) $\int_0^3 \frac{1}{1+y^5} dy$, $n = 6$

(i) 1.064275 (ii) 1.074915

Homework Key for Section 4

1. Let $g(x) = \int_0^x f(t) dt$, where f is the function whose graph is below.

(a) Evaluate $g(0) = 0, g(1) = 2, g(2) = 5, g(3) = 7$ and $g(6) = 3$

(b) $(0, 3)$

(c) $x = 3$

2. Find Part I of the FTC for the following:

(a) $g'(x) = \frac{1}{x^3+1}$

(b) $g'(y) = y^2 \sin y$

3. Evaluate the following.

(a) $\int_{-1}^2 (x^3 - 2x) dx = 3/4$

(b) $\int_1^4 (5 - 2t + 3t^2) dt = 63$

(c) $\int_0^1 x^{4/5} dx = 5/9$

(d) $\int_1^2 \frac{3}{t^4} dt = 7/8$

(e) $\int_0^2 x(2 + x^5) dx = 156/7$

(f) $\int_1^9 \frac{x-1}{\sqrt{x}} dx = 40/3$

(g) $\int_1^9 \frac{1}{2x} dx = \ln 3$

(h) $\int_0^1 10^x dx = 9/\ln 10$

Homework Key for Section 5

1. Find the general indefinite integral:

(a) $1/3x^3 - (1/x) + C$

(b) $2t - t^2 + 1/3t^3 - 1/4t^4 + C$

(c) $1/3x^3 - 4\sqrt{x} + C$

2. Evaluate the following.

(a) $\int_0^2 (6x^2 - 4x + 5) dx = 18$

(b) $\int_{-1}^0 (2x - e^x) dx = -2 + 1/e$

(c) $\int_{-2}^2 (3u + 1)^2 du = 52$

(d) $\int_1^4 \sqrt{t}(1+t) dt = 256/15$

3. For the following velocities, find the (a) displacement and (b) distance traveled.

(a) (a) $-3/2 m$ (b) $41/6 m$

(b) (a) $-10/3 m$ (b) $98/3 m$

Homework Key for Section 6

1. Find the integral using the given substitution:

(a) $2/9(x^3 + 1)^{3/2} + C$

(b) $-1/4\cos^4 \theta + C$

2. Evaluate the indefinite integrals:

(a) $1/3(2x + x^2)^{3/2} + C$

(b) $-1/3 \ln |5 - 3x| + C$

(c) $-(1/\pi)\cos(\pi t) + C$

(d) $2/3\sqrt{3ax + bx^3} + C$

(e) $1/3(\ln x)^3 + C$

(f) $2 \sin\sqrt{t} + C$

(g) $1/7 \sin^7 \theta + C$

(h) $2/3(1 + e^x)^{3/2} + C$

(i) $1/2(1 + z^3)^{2/3} + C$

(j) $e^{\tan x} + C$

(k) $\frac{-1}{\sin x} + C$

3. Evaluate the following:

(a) $\int_0^2 (x - 1)^{25} dx = 0$

(b) $\int_0^1 x^2(1 + 2x^3)^5 dx = 182/9$

(c) $\int_0^\pi \sec^2(t/4) dt = 4$

(d) $\int_{-\pi/6}^{\pi/6} \tan^3 \theta d\theta = 0$

(e) $\int_1^2 \frac{e^{1/x}}{x^2} dx = e - \sqrt{e}$

Homework Key for Section 7

1. Find the area of the following shaded regions.

$$\frac{32}{3}$$
$$e - \left(\frac{1}{e}\right) + \frac{10}{3}$$

2. Sketch the region, draw a typical rectangle and find the area of the following:

- (a) $1/6$
- (b) $\ln 2 - 1/2$
- (c) 72
- (d) $8/3$
- (e) $1/2$