

Homework Key for Section 1

1. Find the volume by rotating the following regions bounded by the curves, about the specified lines. Sketch the region, the solid and a typical disk or washer.

(a) $\pi/2$

(b) 162π

(c) $4\pi/21$

(d) $64\pi/15$

Homework Key for Section 2

1. Find the volume by rotating the following regions bounded by the curves, about the specified lines. Sketch the region, the solid and a typical shell.

(a) $y = 1/x$, $x = 1$, $x = 2$, $y = 0$ about the y -axis

$$2\pi$$

(b) $y = e^{-x^2}$, $x = 0$, $x = 1$, $y = 0$ about the y -axis

$$\pi \left(1 - \frac{1}{e}\right)$$

(c) $1 + y^2 = x$, $x = 0$, $y = 1$, $y = 2$ about the x -axis

$$\frac{21\pi}{2}$$

(d) $y = x^3$, $x = 0$, $y = 8$ about the x -axis

$$\frac{768\pi}{7}$$

(e) $y = 4x - x^2$, $y = 3$ about the line $x = 1$

$$\frac{8\pi}{3}$$

2. Set up but DO NOT EVALUATE the solid obtained by rotating the region bounded by $y = \ln x$, $y = 0$ and $x = 2$ about the y -axis.

$$\int_1^2 2\pi x \ln x \, dx$$

Homework Key for Section 3

1. Find the average value of the function on the given interval.

(a) $f(x) = \sqrt[3]{x}$, $[1, 8]$

$$\frac{45}{28}$$

(b) $f(x) = xe^{-x^2}$, $[0, 5]$

$$\frac{1}{10}(1 - e^{-25})$$

(c) $f(x) = \cos^4 x \sin x$, $[0, \pi]$

$$\frac{2}{5\pi}$$

2. For the function $f(x) = (x - 3)^2$ on $[2, 5]$:

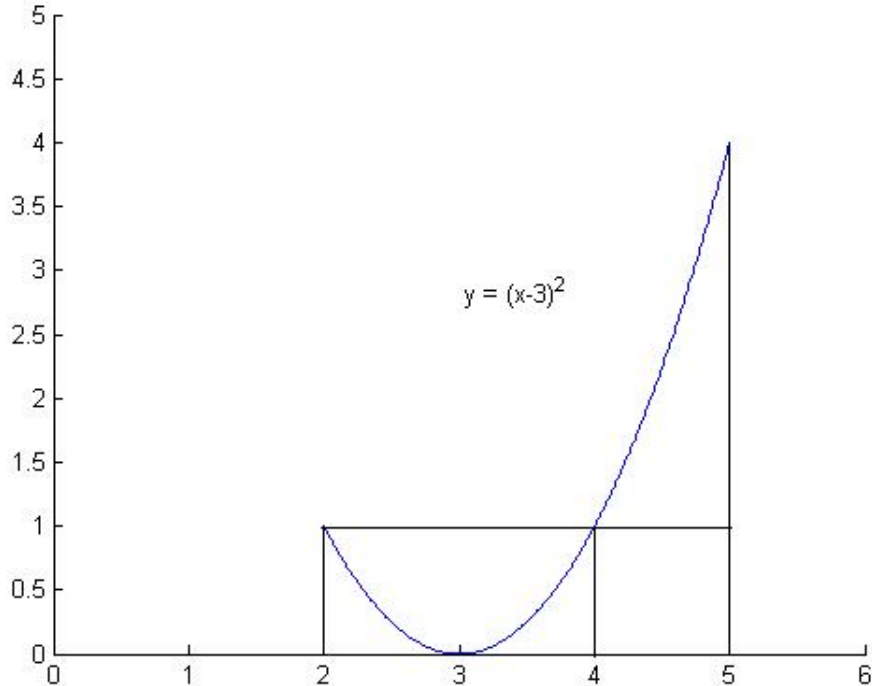
(a) find the average value

$$1$$

(b) find c such that $f_{avg} = c$

$$2, 4$$

(c) sketch f and a rectangle whose area is the same as the area under f



Homework Key for Section 4

1. SET UP ONLY an integral for the length of $y = \cos x$ from $0 \leq x \leq 2\pi$

$$\int_0^{2\pi} \sqrt{1 + \sin^2 x} dx$$

2. Find the length of $y = 1 + 6x^{3/2}$, $0 \leq x \leq 1$

$$\frac{2}{243} (82\sqrt{82} - 1)$$

Homework Key for Section 5

1. SET UP ONLY an integral for the area of the surface created by rotating $y = x^4$ from $0 \leq x \leq 1$ about the x -axis AND the y -axis

$$\text{(x-axis)} \quad \int_0^1 2\pi x^4 \sqrt{1 + 16x^6} \, dx$$

$$\text{(y-axis)} \quad \int_0^1 2\pi x \sqrt{1 + 16x^6} \, dx$$

2. Find the area of the surface by rotating $y = x^3$, $0 \leq x \leq 2$ about the x -axis.

$$\frac{\pi}{27} \left(145\sqrt{145} - 1 \right)$$