

AP Calculus Homework 16

Please write your answer on a separate piece of paper and submit it on Classkick or write your answer directly on Classkick.

Please write all answers in exact forms. For example, write π instead of 3.14.

Questions with a * are optional. Questions with ** are optional and more challenging.

1. Find the volume of the solid obtained by rotating the region bounded by the given curves about the specified line.

a) $x = 2\sqrt{y}$, $x = 0$, $y = 9$; about the y -axis

b) $y = \ln x$, $y = 1$, $y = 2$, $x = 0$; about the y -axis

c) $y^2 = x$, $x = 2y$; about the y -axis

d)* $y = x$, $y = \sqrt{x}$; about $y = 1$

e)* $y = 1/x$, $y = 0$, $x = 1$, $x = 3$; about $y = -1$

f)** $y = x^2$, $x = y^2$; about $x = -1$

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

a) $g(x) = \sqrt[3]{x}$, $[1, 8]$ b) $f(t) = te^{-t^2}$, $[0, 5]$ c) $h(x) = \cos^4 x \sin x$, $[0, \pi]$

3.* If f is continuous and $\int_1^3 f(x)dx = 8$. Show that f takes on the value 4 at least once on the interval $[1, 3]$.

4. Find the length of the curve.

a) $y = 1 + 6x^{3/2}$, $0 \leq x \leq 1$

b)** $y = \frac{x^5}{6} + \frac{1}{10x^3}$, $1 \leq x \leq 2$

c) $x = \frac{1}{3}\sqrt{y}(y - 3)$, $1 \leq y \leq 9$

d)* $y = \ln(\cos x)$, $0 \leq x \leq \pi/3$

e)** $y = \sqrt{x - x^2} + \sin^{-1} \sqrt{x}$, $(0 \leq x \leq 1)$

5. Find the length of the arc of the curve from point P to point Q .

$$y = \frac{1}{2}x^2, \quad P(-1, \frac{1}{2}), \quad Q(1, \frac{1}{2})$$

6.* Find the arc length function for the curve $y = 2x^{3/2}$ with starting point $P_0(1, 2)$.

7. What is the length of the arc of $y = \frac{2}{3}x^{3/2}$ from $x = 0$ to $x = 3$?

- (A) $\frac{8}{3}$ (B) 4 (C) $\frac{14}{3}$ (D) $\frac{16}{3}$ (E) 7

8. What is the average value of $y = x^2\sqrt{x^3 + 1}$ on the interval $[0, 2]$.

- (A) $\frac{26}{9}$ (B) $\frac{52}{9}$ (C) $\frac{26}{3}$ (D) $\frac{52}{3}$ (E) 24