EMCF 39

Question 1

Compute the lower Riemann sum for the given function $f(x) = 3 - x^2$ over the interval $x \in [0, 1]$ with respect to the partition $P = \left[0, \frac{1}{4}, \frac{3}{4}, 1\right]$

a) $^{165}/_{64}$

b) $^{181}/_{64}$

c) $^{169}/_{64}$

d) $^{157}/_{64}$

e) $^{173}/_{64}$

Question 2

Given that

$$\left[\int_0^2 f(x)\,dx = 2, \int_0^3 f(x)\,dx = 2, \int_3^6 f(x)\,dx = 1\right]$$

find

$$\int_0^6 f(x)\,dx$$

a) 3

b) 5

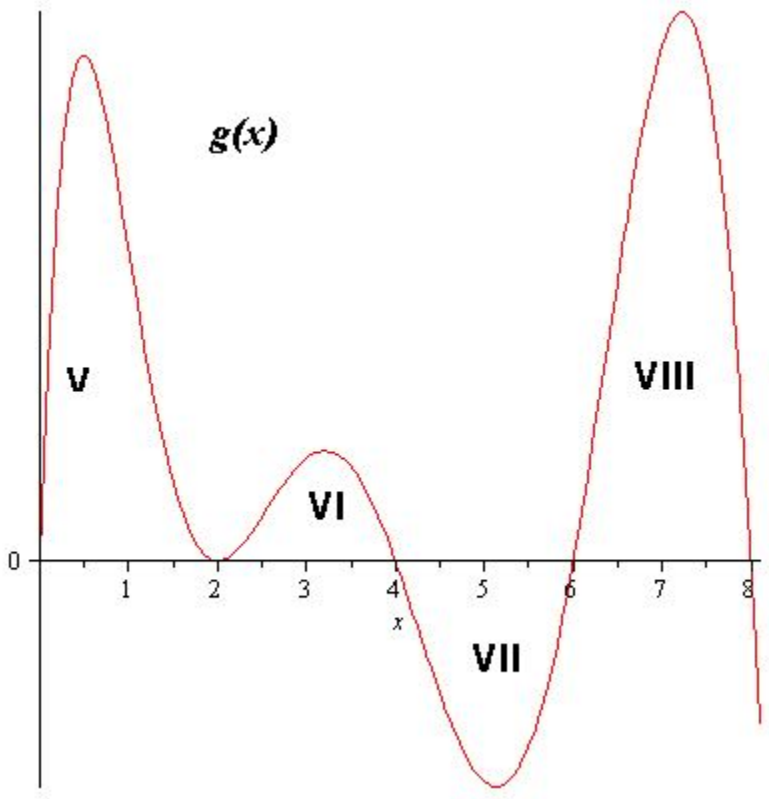
c) 1

d) -1

e) 2

Question 3

The graph of ***g* (*x*)** is shown below. Regions V, VI, VII and VIII have areas 4, $^{3}/_{2}$, $^{5}/_{2}$ and 6 respectively.



Compute the following integral (**pay attention to the endpoints**).

$$\int_0^6 (-2\,g(x))\,dx$$

a) -28

b) -6

c) -16

d) -20

e) 1

Question 4

Find a formula for $f(x)$ given that f is continuous and

$$4x^4 + x^2 - 5x = \int_0^x \frac{f(t)}{t+1}\,dt$$

a) $f(x) = 4x^4 + x^2 - 5x$

b) $f(x) = \frac{4}{5}x^5 + \frac{1}{3}x^3 - \frac{5}{2}x^2 - 5$

c) $f(x) = 16x^3 + 2x - 5$

d) $f(x) = (4x^4 + x^2 - 5x)(x + 1)$

e) $f(x) = (16x^3 + 2x - 5)(x + 1)$

Question 5

Given that $x > -2$ and

$$F(x) = \int_4^x t\sqrt{t+2}\ dt$$

find $F(4)$.

a) 4

b) 0

c) $4\sqrt{6}$

d) $\sqrt{6}$

e) $4\sqrt{6}/3$

Question 6

Find the derivative of the function F

$$F(x) = \int_0^{x\sin(x)} \sqrt{36 - t^2}\ dt$$

a) $\sqrt{36 - x^2}$

b) $(\sin(x) + x\cos(x))\sqrt{36 - x^2}$

c) $-\frac{(x\sin(x))}{\sqrt{36 - (x\sin(x))^2}}$

d) $\sqrt{36-(x\sin(x))^2}$

e) $(\sin(x)+x\cos(x))\sqrt{36-(x\sin(x))^2}$

Question 7

Evaluate the definite integral:

$$\int_1^3 (7x+x^3)\,dx$$

a) $382/5$

b) 40

c) 48

d) $110/3$

e) 20

Question 8

Evaluate the definite integral:

$$\int_1^9 3\sqrt{x}\,dx$$

a) 12

b) 52

c) $484/5$

d) 6

e) $1452/5$

Question 9

Find the area bounded by the curves

$$y=5-x^2$$
$$y=8-4x$$

a) $^{2}/_{3}$

b) $^{4}/_{3}$

c) $-^{2}/_{3}$

d) $^{8}/_{3}$

e) $-^{4}/_{3}$

Question 10

Calculate the indefinite integral:

$$\int \frac{6x^3 - 5}{x^2}\,dx$$

a) $3x^2 - 5x + C$

b) $2x^3 - 5x + C$

c) $3x^2 + \frac{5}{x} + C$

d) $\frac{2\left(3x^3 + 5\right)}{x^3} + C$

e) $6x + \frac{5}{x} + C$

Question 11

Calculate the indefinite integral:

$$\int \left(3\sqrt{x} - \frac{7}{\sqrt{x}}\right) dx$$

a) $\frac{14}{3}x^{3/2} + \frac{6}{5}x^{5/2} + C$

b) $-14\sqrt{x}+2x^{3/2}+C$

c) $14\sqrt{x}+2x^{3/2}+C$

d) $-\frac{8}{3}x^{3/2}+C$

e) $\frac{3}{2\sqrt{x}}+\frac{7}{2x^{3/2}}+C$

Question 12

Calculate:

$$\int \frac{10x+20}{\sqrt{x^2+4x-3}}\,dx$$

a) $10\sqrt{x^2+4x-3}+C$

b) $-2\sqrt{x^2+4x-3}+C$

c) $2\sqrt{x^2+4x-3}+C$

d) $-10\sqrt{x^2+4x-3}+C$

e) $5\sqrt{x^2+4x-3}+C$

Question 13

Calculate the integral:

$$\int \sin^7(4x)\cos(4x)\,dx$$

a) $-\frac{1}{28}\sin^8(4x)+C$

b) $-\frac{1}{8}\sin^8(4x)+C$

c) $\frac{1}{32}\sin^8(4x)+C$

d) $-\frac{1}{8}\cos^8(4x)+C$

e) $\frac{1}{2}\cos^8(4x) + C$

Question 14

Evaluate:

$$\int_0^a 10x\sqrt{a^2 - x^2}\,dx$$

a) $\frac{10}{3}a^2$

b) 0

c) $\frac{10}{3}a^3$

d) $10a^2$

e) $10a^3$

Question 15

Find f based on the following information:

$$f''(x) = \cos(x)$$
$$f'(0) = 3$$
$$f(0) = 1$$

a) $f(x) = -\cos(x) + 3x$

b) $f(x) = \cos(x) - 3x$

c) $f(x) = -\cos(x) + 3x + 2$

d) $f(x) = -\sin(x) - 1$

e) $f(x) = \sin(x) + 1$

Question 16

Find the average value of the function $f(x)$ on the interval [0, 2] and determine a number c in this interval for which $f(c)$ is equal to the average value.

$$f(x) = 10x - 5x^2$$

a) Average value = 0, $c = 0$

b) Average value = 10/3, $c = \left\{1 - \frac{1}{3}\sqrt{3}, 1 + \frac{1}{3}\sqrt{3}\right\}$

c) Average value = 20/3, $c = \frac{20}{3}$

d) Average value = 20/3, $c = \frac{1}{2} - \frac{1}{6}\sqrt{3}$

e) Average value = 10/3, $c = 1 - \frac{1}{3}\sqrt{3}$

Question 17

Which of the following integrals represents the area of the region bounded by the curves, $y = -3x^{1/2}$, $y = x - 4$, and $y = 0$, **in terms of *x***?

a) $\int_0^4 \left(-3\sqrt{x}\right) dx + \int_4^5 (x-4)\, dx$

b) $\int_0^4 3\sqrt{x}\, dx$

c) $\int_0^1 3\sqrt{x}\, dx + \int_1^4 (-x+4)\, dx$

d) $\int_0^2 3\sqrt{x}\, dx + \int_2^4 (-x+4)\, dx$

e) $\int_0^1 \left(-3\sqrt{x}\right) dx + \int_1^4 (-x+4)\, dx$

Question 18

Which of the following integrals represents the area of the region bounded by the curves, $y = -9x^{1/2}$, $y = x - 10$, and $y = 0$, **in terms of *y***?

a) $\int_0^{10} \left(y + 10 - \frac{1}{81}y^2\right) dy$

b) $\int_0^{10} \frac{1}{81}y^2\, dy$

c) $\int_{-9}^{0} (y + 10)\, dy$

d) $\int_{-9}^{0} \left(y + 10 - \frac{1}{81}y^2\right) dy$

e) $\int_{-9}^{0} \left(\frac{1}{81}y^2 - y - 10\right) dy$

Question 19

Sketch the region bounded by the following curves and find the volume of the solid generated by revolving this region about the *x*-axis.

$$y = 10\sqrt{x}$$
$$y = 10x^3$$

a) $\frac{264}{7}\pi$

b) $\frac{257}{7}\pi$

c) $\frac{250}{7}\pi$

d) $\frac{271}{7}\pi$

e) $\frac{278}{7}\pi$

Question 20

Sketch the region bounded by the following curves and find the volume of the solid generated by revolving this region about the *y*-axis.

$$x = y^3$$
$$x = 1$$
$$y = 0$$

a) $\frac{13}{7}\pi$

b) $\frac{27}{7}\pi$

c) $\frac{34}{7}\pi$

d) $\frac{6}{7}\pi$

e) $\frac{20}{7}\pi$