

1.  $\int_0^1 \sqrt{x^2 - 2x + 1} dx$  is

- A. -1                      B.  $-\frac{1}{2}$                       C.  $\frac{1}{2}$                       D. 1                      E. none of the above

2. What is the average (mean) value of  $3t^3 - t^2$  over the interval  $-1 \leq t \leq 2$ ?

- A.  $\frac{11}{4}$                       B.  $\frac{7}{2}$                       C. 8                      D.  $\frac{33}{4}$                       E. 16

3. If  $\begin{cases} f(x) = 8 - x^2 & \text{for } -2 \leq x \leq 2 \\ f(x) = x^2 & \text{elsewhere} \end{cases}$  then  $\int_{-1}^3 f(x) dx$  is a number between

- A. 0 and 8                      B. 8 and 16                      C. 16 and 24                      D. 24 and 32                      E. 32 and 40

4. If  $F(x) = \int_0^x e^{-t^2} dt$ , then  $F'(x) =$

- A.  $2xe^{-x^2}$                       B.  $-2xe^{-x^2}$                       C.  $\frac{e^{-x^2+1}}{-x^2+1} - e$                       D.  $e^{-x^2} - 1$                       E.  $e^{-x^2}$

5. If  $f(x) = \int_0^x \frac{1}{\sqrt{t^3+2}} dt$ , which of the following is FALSE?

- A.  $f(0) = 0$   
B.  $f$  is continuous at  $x$  for all  $x \geq 0$   
C.  $f(1) > 0$   
D.  $f'(1) = \frac{1}{\sqrt{3}}$   
E.  $f(-1) > 0$

---

6. If  $F$  and  $f$  are continuous functions such that  $F'(x) = f(x)$  for all  $x$ , then  $\int_a^b f(x) dx$  is

A.  $F'(a) - F'(b)$

B.  $F'(b) - F'(a)$

C.  $F(a) - F(b)$

D.  $F(b) - F(a)$

E. none of the above

---

7.  $\int (x^3 - 3x) dx =$

A.  $3x^2 - 3 + C$

B.  $4x^4 - 6x^2 + C$

C.  $\frac{x^4}{3} - 3x^2 + C$

D.  $\frac{x^4}{4} - 3x + C$

E.  $\frac{x^4}{4} - \frac{3x^2}{2} + C$

---

8.  $\int_0^{\frac{\pi}{4}} \tan^2 x dx =$

A.  $\frac{\pi}{4} - 1$

B.  $1 - \frac{\pi}{4}$

C.  $\frac{1}{3}$

D.  $\sqrt{2} - 1$

E.  $\frac{\pi}{4} + 1$

---

9.  $\int \frac{5}{1+x^2} dx =$

A.  $\frac{-10x}{(1+x^2)^2} + C$

B.  $\frac{5}{2x} \ln(1+x^2) + C$

C.  $5x - \frac{5}{x} + C$

D.  $5 \arctan x + C$

E.  $5 \ln(1+x^2) + C$

---

10. The average value of  $\sqrt{x}$  over the interval  $0 \leq x \leq 2$  is

A.  $\frac{\sqrt{2}}{3}$

B.  $\frac{\sqrt{2}}{2}$

C.  $\frac{2\sqrt{2}}{3}$

D. 1

E.  $\frac{4\sqrt{2}}{3}$

---

11.  $\int_1^2 x^{-3} dx =$

A.  $-\frac{7}{8}$

B.  $-\frac{3}{4}$

C.  $\frac{15}{64}$

D.  $\frac{3}{8}$

E.  $\frac{15}{16}$

---

---

12. Which of the following is equal to  $\ln 4$  ?

A.  $\ln 3 + \ln 1$

B.  $\frac{\ln 8}{\ln 2}$

C.  $\int_1^4 e^t dt$

D.  $\int_1^4 \ln x dx$

E.  $\int_1^4 \frac{1}{t} dt$

---

13.  $\int_1^2 \frac{x^2 - 1}{x + 1} dx =$

A.  $\frac{1}{2}$

B. 1

C. 2

D.  $\frac{5}{2}$

E.  $\ln 3$

---

14. If  $\int_{-2}^2 (x^7 + k) dx = 16$  , then  $k =$

A. -12

B. -4

C. 0

D. 4

E. 12

---

15.  $\int_0^3 |x - 1| dx =$

A. 0

B.  $\frac{3}{2}$

C. 2

D.  $\frac{5}{2}$

E. 6

---

16. Let  $f$  be a continuous function on the closed interval  $[0, 2]$ . If  $2 \leq f(x) \leq 4$  , then the greatest possible value of  $\int_0^2 f(x) dx$  is

A. 0

B. 2

C. 4

D. 8

E. 16

---

17.  $\int \sec^2 x dx =$

A.  $\tan x + C$

B.  $\csc^2 x + C$

C.  $\cos^2 x + C$

D.  $\frac{\sec^3 x}{3} + C$

E.  $2 \sec^2 x \tan x + C$

---

18. If  $\int_0^k (2kx - x^2) dx = 18$  , then  $k =$

A. -9

B. -3

C. 3

D. 9

E. 18

---

---

19.  $\int_1^4 |x-3| dx =$

A.  $-\frac{3}{2}$

B.  $\frac{3}{2}$

C.  $\frac{5}{2}$

D.  $\frac{9}{2}$

E. 5

---

20.  $\int_0^1 (3x-2)^2 dx =$

A.  $-\frac{7}{3}$

B.  $-\frac{7}{9}$

C.  $\frac{1}{9}$

D. 1

E. 3

---

21. If  $F(x) = \int_1^{x^2} \sqrt{1+t^3} dt$ , then  $F'(x) =$

A.  $2x\sqrt{1+x^6}$

B.  $2x\sqrt{1+x^3}$

C.  $\sqrt{1+x^6}$

D.  $\sqrt{1+x^3}$

E.  $\int_1^{x^2} \frac{3t^2}{2\sqrt{1+t^3}} dt$

---

22. The average value of  $\frac{1}{x}$  on the closed interval  $[1, 3]$  is

A.  $\frac{1}{2}$

B.  $\frac{2}{3}$

C.  $\frac{\ln 2}{2}$

D.  $\frac{\ln 3}{2}$

E.  $\ln 3$

---

23.  $\int (x^2+1)^2 dx =$

A.  $\frac{(x^2+1)^3}{3} + C$

B.  $\frac{(x^2+1)^3}{6x} + C$

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

D.  $\frac{2x(x^2+1)^3}{3} + C$

E.  $\frac{x^5}{5} + \frac{2x^3}{3} + x + C$

---

24.  $\int_1^{500} (13^x - 11^x) dx + \int_2^{500} (11^x - 13^x) dx =$

A. 0.000

B. 14.946

C. 34.415

D. 46.000

E. 136.364

---

---

25. If the second derivative of  $f$  is given by  $f''(x) = 2x - \cos x$ , which of the following could be  $f(x)$ ?

A.  $\frac{x^3}{3} + \cos x - x + 1$

B.  $\frac{x^3}{3} - \cos x - x + 1$

C.  $x^3 + \cos x - x + 1$

D.  $x^2 - \sin x + 1$

E.  $x^2 + \sin x + 1$

---

26. If  $\int_a^b f(x)dx = 5$  and  $\int_a^b g(x)dx = -1$ , which of the following must be true?

I.  $f(x) > g(x)$  for  $a \leq x \leq b$

II.  $\int_a^b (f(x) + g(x))dx = 4$

III.  $\int_a^b (f(x)g(x))dx = -5$

A. I only

B. II only

C. III only

D. II and III only

E. I, II, and III

---

27. Which of the following is equal to  $\int_0^\pi \sin x dx$ ?

A.  $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos x dx$

B.  $\int_0^\pi \cos x dx$

C.  $\int_{-\pi}^0 \sin x dx$

D.  $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin x dx$

E.  $\int_\pi^{2\pi} \sin x dx$

---

28. If  $\int_a^b f(x)dx = a + 2b$ , then  $\int_a^b (f(x) + 5)dx =$

A.  $a + 2b + 5$

B.  $5b - 5a$

C.  $7b - 4a$

D.  $7b - 5a$

E.  $7b - 6a$

---

29.  $\int_1^2 (4x^3 - 6x)dx =$

A. 2

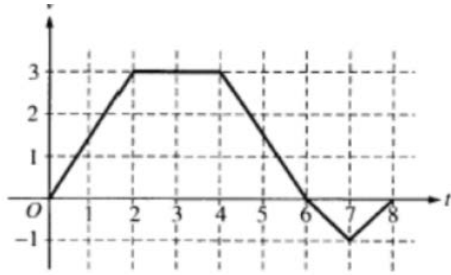
B. 4

C. 6

D. 36

E. 42

---



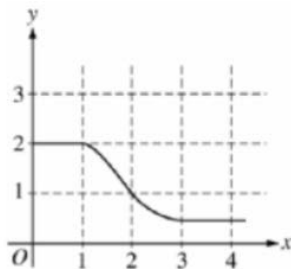
A bug begins to crawl up a vertical wire at time  $t = 0$ . The velocity  $v$  of the bug at time  $t$ , interval, is given by the function whose graph is shown above.

30. At what value of  $t$  does the bug change direction?

- A. 2                      B. 4                      C. 6                      D. 7                      E. 8

31. What is the total distance the bug traveled from  $t = 0$  to  $t = 8$ ?

- A. 14                      B. 13                      C. 11                      D. 8                      E. 6



32. The graph of  $f$  is shown in the figure above. If  $\int_1^3 f(x)dx = 2.3$  and  $F'(x) = f(x)$ , then  $F(3) - F(0) =$

- A. 0.3                      B. 1.3                      C. 3.3                      D. 4.3                      E. 5.3

33.  $\int_0^x \sin t dt =$

- A.  $\sin x$                       B.  $-\cos x$                       C.  $\cos x$                       D.  $\cos x - 1$                       E.  $1 - \cos x$

34.  $\int_0^1 \sqrt{x}(x+1)dx =$

- A. 0                      B. 1                      C.  $\frac{16}{15}$                       D.  $\frac{7}{5}$                       E. 2

---

35. Which of the following are antiderivatives of  $f(x) = \sin x \cos x$  ?

I.  $F(x) = \frac{\sin^2 x}{2}$

II.  $F(x) = \frac{\cos^2 x}{2}$

III.  $F(x) = \frac{-\cos(2x)}{4}$

A. I only

B. II only

C. III only

D. I and III only

E. II and III only

---

36.  $\int_1^e \left( \frac{x^2 - 1}{x} \right) dx =$

A.  $e - \frac{1}{e}$

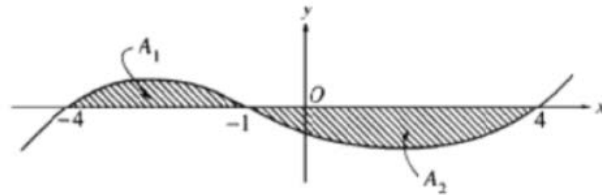
B.  $e^2 - e$

C.  $\frac{e^2}{2} - e + \frac{1}{2}$

D.  $e^2 - 2$

E.  $\frac{e^2}{2} - \frac{3}{2}$

---



37. The graph of  $y = f(x)$  is shown in the figure above. If  $A_1$  and  $A_2$  are positive numbers that represent the areas of the shaded regions, then in terms of  $A_1$  and  $A_2$ ,  $\int_{-4}^4 f(x) dx - 2 \int_{-1}^4 f(x) dx =$

A.  $A_1$

B.  $A_1 - A_2$

C.  $2A_1 - A_2$

D.  $A_1 + A_2$

E.  $A_1 + 2A_2$

---

38. If  $F(x) = \int_0^x \sqrt{t^3 + 1} dt$ , then  $F'(2) =$

A. -3

B. -2

C. 2

D. 3

E. 18

---

39. What are all values of  $k$  for which  $\int_{-3}^k x^2 dx = 0$  ?

A. -3

B. 0

C. 3

D. -3 and 3

E. -3, 0, and 3

---

---

40. If  $0 \leq k < \frac{\pi}{2}$  and the area under the curve  $y = \cos x$  from  $x = k$  to  $x = \frac{\pi}{2}$  is 0.1, then  $k =$

A. 1.471

B. 1.414

C. 1.277

D. 1.120

E. 0.436

---

41. If  $f(x) = g(x) + 7$  for  $3 \leq x \leq 5$ , then  $\int_3^5 [f(x) + g(x)] dx$

A.  $2 \int_3^5 g(x) dx + 7$

B.  $2 \int_3^5 g(x) dx + 14$

C.  $2 \int_3^5 g(x) dx + 28$

D.  $\int_3^5 g(x) dx + 7$

E.  $\int_3^5 g(x) dx + 14$

---

42.  $\frac{d}{dx} \int_0^x \cos(2\pi u) du$  is

A. 0

B.  $\frac{1}{2\pi} \sin x$

C.  $\frac{1}{2\pi} \cos(2\pi x)$

D.  $\cos(2\pi x)$

E.  $2\pi \cos(2\pi x)$

---



## Integrals and FTC MC Review

1. C

2. A

3. D

4. E

5. E

6. D

7. E

8. B

9. D

10. C

11. D

12. E

13. A

14. D

15. D

16. D

17. A

18. C

19. C

20. D

21. A

22. D

23. E

24. B

25. A

26. B

27. A

28. C

29. C

30. C

31. B

32. D

33. E

34. C

35. D

36. E

37. D

38. D

39. A

40. D

41. B

42. D