## Integrals 1 Test Review

Name

**1.** What is the average value of y for the part of the curve $y = 3x - x^2$ , which is the *first quadrant*?

(A) −6

(B) −2

(C) $\frac{3}{2}$

(D) $\frac{9}{4}$

(E) $\frac{9}{2}$

---

**2.** If the function *f* given by *f* (*x*) = $x^3$ has an average value of 9 on the closed interval [0, *k*], then *k* =

(A) 3

(B) $3^{\frac{1}{2}}$

(C) $18^{\frac{1}{3}}$

(D) $36^{\frac{1}{4}}$

(E) $36^{\frac{1}{3}}$

---

**3.** The average (mean) value of $\sqrt{x}$ over the interval $0 \leq x \leq 2$ is

## Integrals 1 Test Review

(A) $\frac{1}{3}\sqrt{2}$

(B) $\frac{1}{2}\sqrt{2}$

(C) $\frac{2}{3}\sqrt{2}$

(D) 1

(E) $\frac{4}{3}\sqrt{2}$

---

**4.** The average value of 1/x on the closed interval [1,3] is

(A) 12

(B) 23

(C) In2/2

(D) In3/2

(E) In3

---

**5.** $\frac{d}{dx}\left(\int_0^{x^3} \ln\ \left(t^2+1\right)\ dt\right) =$

## Integrals 1 Test Review

(A) $\frac{2x^3}{x^6+1}$

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

(C) $\ln\ \left(x^6+1\right)$

(D) $2x^3\ \ln\ \left(x^6+1\right)$

(E) $3x^2\ \ln\ \left(x^6+1\right)$

---

**6.** For all $x > 1$ , if $f(x) = \int_t^x \frac{1}{t}dt,$ then $f'(x)$ =

(A) 1

(B) $\frac{1}{x}$

(C) $\ln x - 1$

(D) $\ln x$

(E) $e^x$

---

**7.** Let $g$ be a function with first derivative given by $g'\ (x) = \int_0^x e^{-t^2}\ dt.$ Which of the following must be true on the interval $0 < x < 2$ ?

(A) $g$ is increasing, and the graph of $g$ is concave up.

(B) $g$ is increasing, and the graph of $g$ is concave down.

(C) $g$ is decreasing, and the graph of $g$ is concave up.

(D) $g$ is decreasing, and the graph of $g$ is concave down.

(E) $g$ is decreasing, and the graph of $g$ has a point of inflection on $0 < x < 2$.

---

**8.** $\frac{d}{dx}\left(\int_0^{x^2} \sin\left(t^3\right)\, dt\right) =$

(A) $-\cos\left(x^6\right)$

(B) $\sin\left(x^3\right)$

(C) $\sin\left(x^6\right)$

(D) $2x \sin\left(x^3\right)$

(E) $2x \sin\left(x^6\right)$

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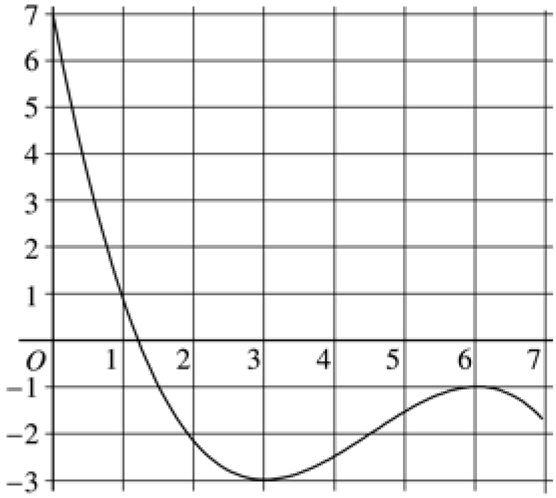
## Integrals 1 Test Review

**9.**




Graph of $f$

The graph of the function $f$ shown in the figure above has horizontal tangents at $x = 3$ and $x = 6$. If $g(x) = \int_0^{2x} f(t)\,dt$, what is the value of $g'(3)$?

(A) 0

(B) -1

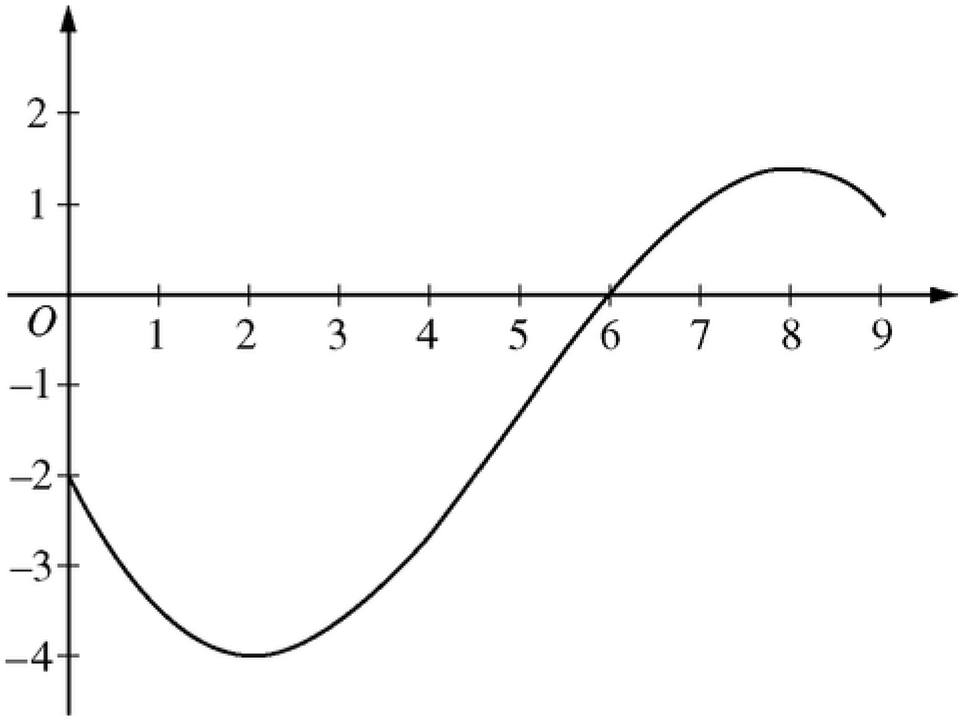
(C) -2

(D) -3

(E) -6

## Integrals 1 Test Review

**10.**



Graph of $f$

The graph of a differentiable function *f* is shown above. If $h(x)=\int_0^x f(t)\ dt$, which of the following is true?

(A) $h(6)<h'(6)<h''(6)$

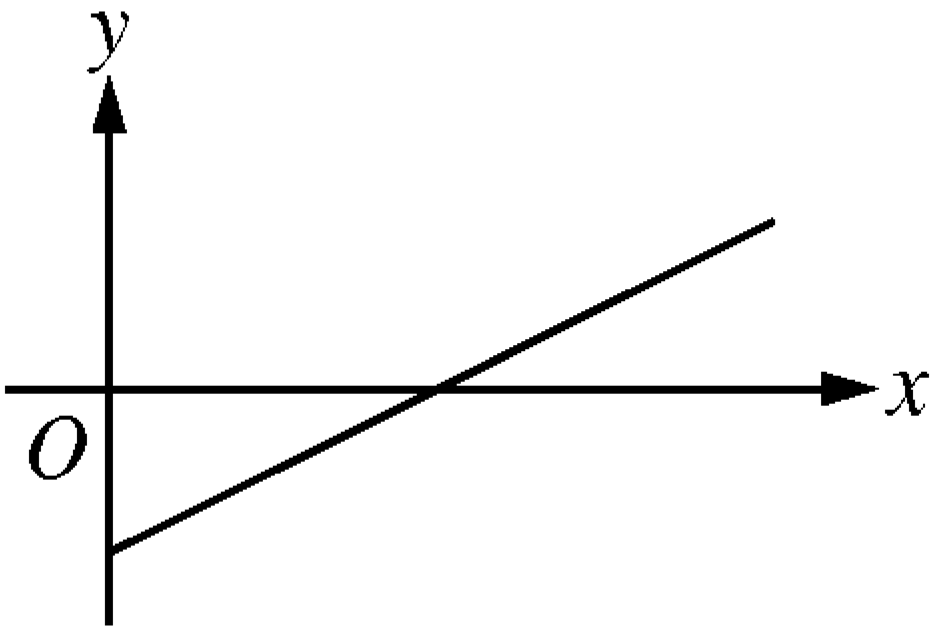
(B) $h(6)<h''(6)<h'(6)$

(C) $h'(6)<h(6)<h''(6)$

(D) $h''(6)<h(6)<h'(6)$

(E) $h''(6)<h'(6)<h(6)$

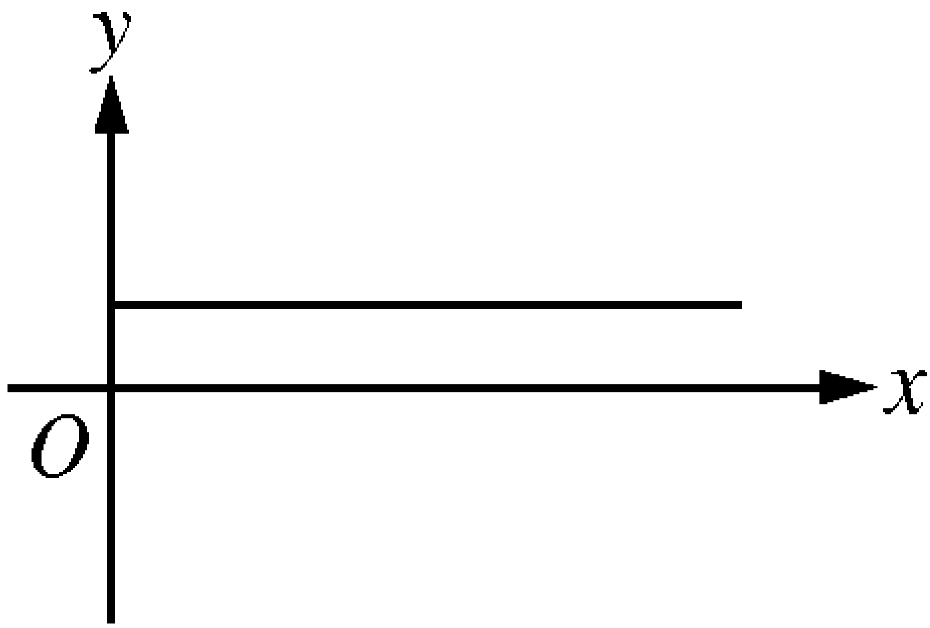
**11.**




Graph of $f$

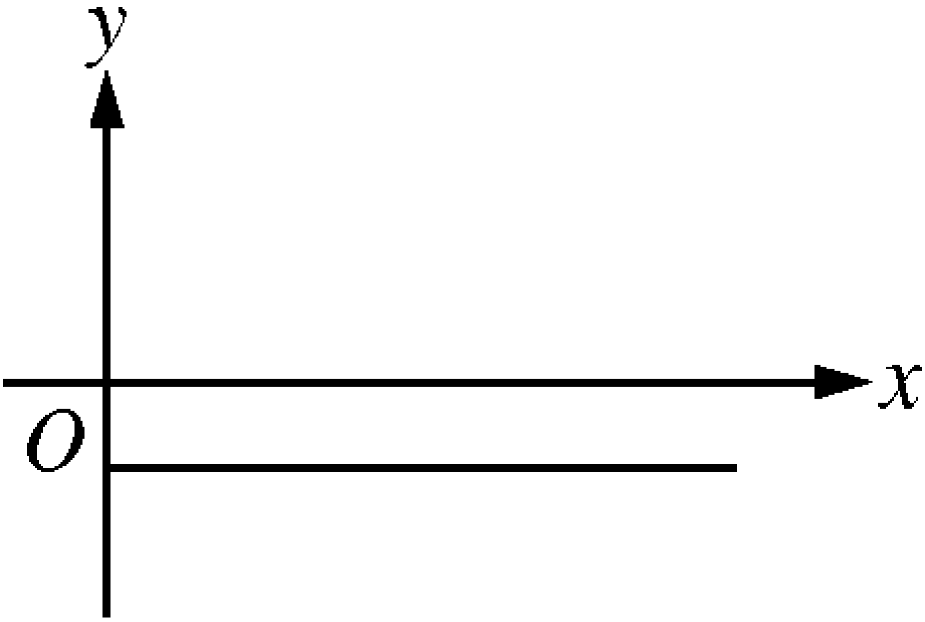
The figure above shows the graph of *f*. If $f(x) = \int_2^x g(t)\ dt$, which of the following could be the graph of $y = g(x)$ ?

(A)

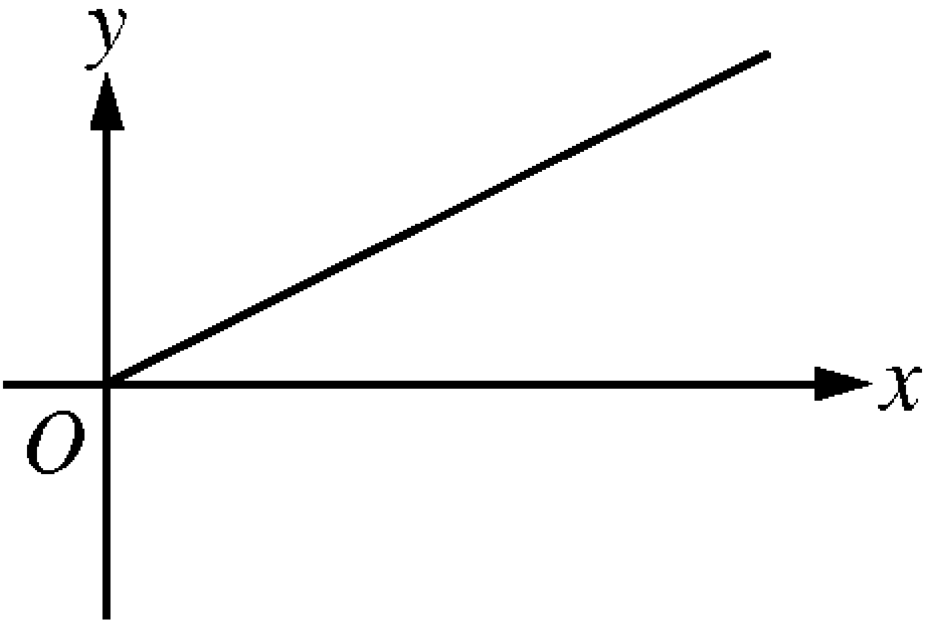


## Integrals 1 Test Review

(B)

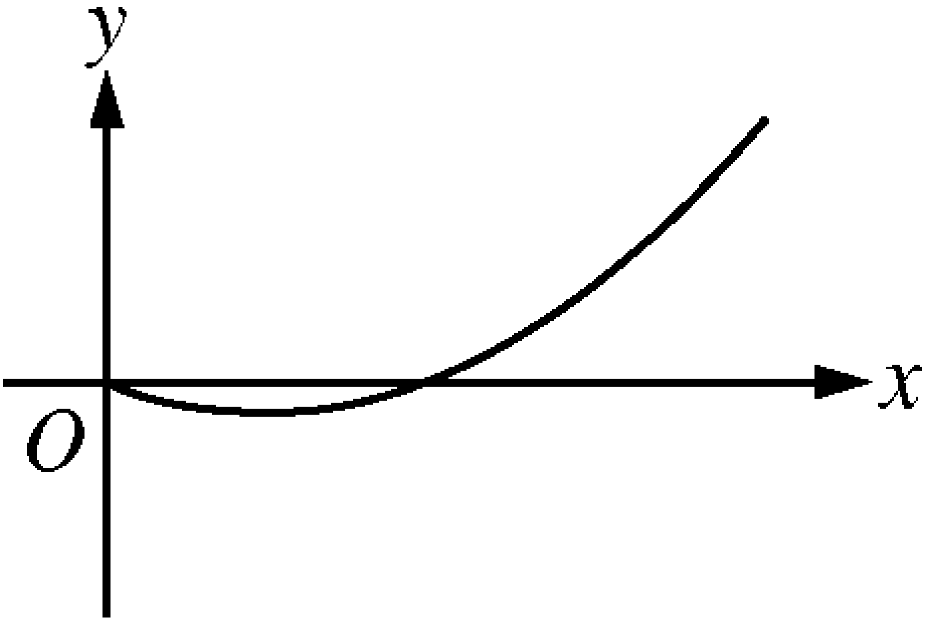



(C)

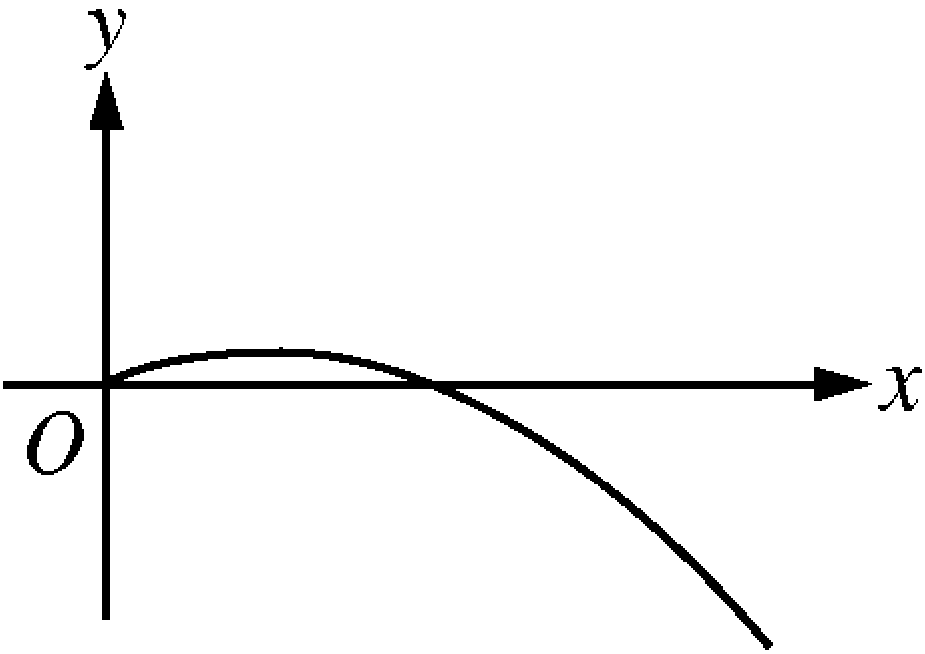


## Integrals 1 Test Review

(D)




(E)




**12.** $\int_{1}^{4} |x-3|dx =$

## Integrals 1 Test Review

(A) $-\frac{3}{2}$

(B) $\frac{3}{2}$

(C) $\frac{5}{2}$

(D) $\frac{9}{2}$

(E) 5

---

**13.** If $\int_1^{10} f(x)dx = 4$ and $\int_{10}^{3} f(x)dx = 7$, then $\int_1^3 f(x)dx =$

(A) −3

(B) 0

(C) 3

(D) 10

(E) 11

---

**14.** The function *f* is defined by $f\left(x\right) = \begin{cases} 2 & \text{for } x < 3 \\ x-1 & \text{for } x \geq 3. \end{cases}$ What is the value of $\int_1^5 f\left(x\right)\ dx$ ?

(A) 2

(B) 6

(C) 8

(D) 10

(E) 12

---

**15.** Given *f(x)* = $\begin{cases} x+1 & \text{for } x<0 \\ \cos\pi & \text{for } x\geq 0 \end{cases}$ $\int_{-1}^{1} f(x)dx =$

(A) $\frac{1}{2}+\frac{1}{\pi}$

(B) $-\frac{1}{2}$

(C) $\frac{1}{2}-\frac{1}{\pi}$

(D) $\frac{1}{2}$

(E) $-\frac{1}{2}+\pi$

---

**16.** If *f* is a linear function and 0<*a*<*b*, then $\int_{a}^{b} f''(x)dx =$

## Integrals 1 Test Review

(A) 0

(B) 1

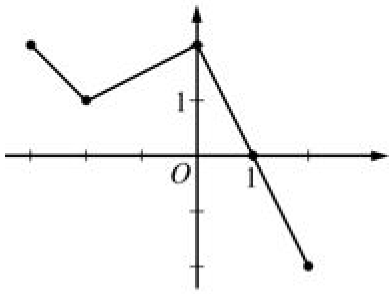
(C) $\frac{ab}{2}$

(D) b-a

(E) $\frac{b^2-a^2}{2}$

---

**17.**




Graph of $f$

The graph of the piecewise linear function *f* is shown in the figure above. If $g(x) = \int_{-2}^{x} f(t)\ dt$, which of the following values is greatest?

(A) *g( −3 )*

(B) g( −2 )

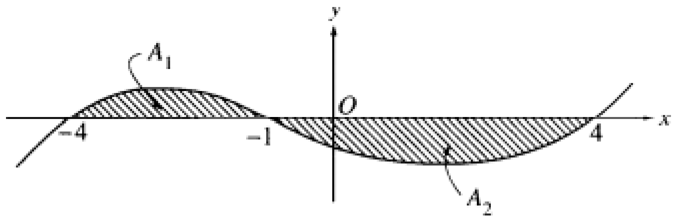
(C) g( 0 )

(D) g( 1 )

(E) g( 2 )

## Integrals 1 Test Review

**18.**




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) $A_1$+$2A_2$

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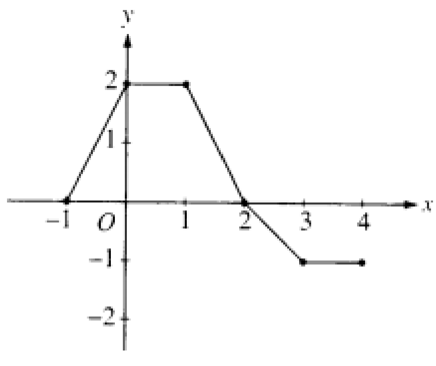
**19.**




The graph of a piecewise-linear function *f*, for $-1 \leq x \leq 4$, is shown above. What is the value of

$\int_{-1}^{4} f(x)dx$?

## Integrals 1 Test Review

(A) 1

(B) 2.5

(C) 4

(D) 5.5

(E) 8

---

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

(A) −9

(B) −3

(C) 3

(D) 9

(E) 18

---

**21.** $\int_0^1 (3x-2)^2\,dx =$

## Integrals 1 Test Review

(A) $-\frac{7}{3}$

(B) $-\frac{7}{9}$

(C) $\frac{1}{9}$

(D) 1

(E) 3

---

**22.** $\int_0^{\frac{\pi}{4}} \sin x \, dx =$

(A) $-\frac{\sqrt{2}}{2}$

(B) $\frac{\sqrt{2}}{2}$

(C) $-\frac{\sqrt{2}}{2} - 1$

(D) $-\frac{\sqrt{2}}{2} + 1$

(E) $\frac{\sqrt{2}}{2} - 1$

---

**23.** $\int_1^2 \frac{x-4}{x^2} dx$

(A) $-\frac{1}{2}$

(B) ln2-2

(C) ln2

(D) 2

(E) ln2+2

---

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

(A) 0

(B) 1

(C) $\frac{16}{15}$

(D) $\frac{7}{5}$

(E) 2

---

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

(A) -3

(B) 0

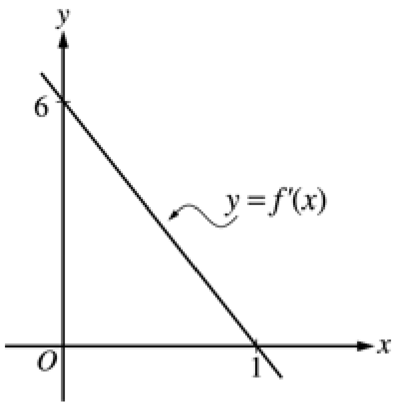
(C) 3

(D) -3 and 3

(E) -3, 0, 3

---

**26.**




The graph of $f'$, the derivative of $f$, is the line shown in the figure above. If $f(0) = 5$, then $f(1) =$

(A) 0

(B) 3

(C) 6

(D) 8

(E) 11

## Integrals 1 Test Review

**27.** $\int \sec^2 x dx=$

(A) $\tan x + c$

(B) $\csc^2 x + c$

(C) $\cos^2 x + c$

(D) $\frac{\sec^3 x}{3} + c$

(E) $2\sec^2 x \tan x + c$

---

**28.** 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) $x^2 - sinx + 1$

(E) $x^2 + \sin x + 1$

---

**29.** $\int_1^e \frac{x^2+1}{x}\, dx =$

## Integrals 1 Test Review

(A) $\frac{e^2-1}{2}$

(B) $\frac{e^2+1}{2}$

(C) $\frac{e^2+2}{2}$

(D) $\frac{e^2-1}{e^2}$

(E) $\frac{2e^2-8e+6}{3e}$

---

**30.**

| $x$ | 2 | 3 | 5 | 8 | 13 |
|---|---|---|---|---|---|
| $f(x)$ | 6 | –2 | –1 | 3 | 9 |

The function $f$ is continuous on the closed interval [ 2,13 ] and has values as shown in the table above. Using the intervals [ 2,3 ], [ 3,5 ], [ 5,8 ], and[ 8,13 ] what is the approximation of $\int_2^{13} f\ (x)\ \ dx$ obtained from a left Riemann sum?

(A) 6

(B) 14

(C) 28

(D) 32

(E) 50

---

## Integrals 1 Test Review

**31.**

| $t$ (hours) | 4 | 7 | 12 | 15 |
|---|---|---|---|---|
| $R(t)$ (liters/hour) | 6.5 | 6.2 | 5.9 | 5.6 |

A tank contains 50 liters of oil at time $t = 4$ hours. Oil is being pumped into the tank at a rate $R(t)$, where $R(t)$ is measured in liters per hour, and $t$ is measured in hours. Selected values of $R(t)$ are given in the table above. Using a right Riemann sum with three subintervals and data from the table, what is the approximation of the number of liters of oil that are in the tank at time $t = 15$ hours?

(A) 64.9

(B) 68.2

(C) 114.9

(D) 116.6

(E) 118.2

**32.**

| $x$ | 2 | 5 | 10 | 14 |
|---|---|---|---|---|
| $f(x)$ | 12 | 28 | 34 | 30 |

The function $f$ is continuous on the closed interval [2,14] and has values as shown in the table above. Using the subintervals [2,5], [5,10], and [10,14], what is the approximation of $\int_2^{14} f(x)\,dx$ found by using a right Riemann sum?

## Integrals 1 Test Review

(A) 296

(B) 312

(C) 343

(D) 374

(E) 390

---

**33.** If the average value of a continuous function *f* on the interval [−2, 4 ] is 12, what is $\int_{-2}^{4} \frac{f(x)}{8} dx$?

(A) $\frac{3}{2}$

(B) 3

(C) 9

(D) 72

---

**34.** Let *f* be a differentiable function such that $f(0) = -5$ and $f'(x) \leq 3$ for all *x*. Of the following, which is not a possible value for *f*(2)?

## Integrals 1 Test Review

(A) -10

(B) -5

(C) 0

(D) 1

(E) 2

---

**35.** Which of the following is an equation for the line tangent to the graph of $y = 3 - \int_{-1}^{x} e^{-t^3}\, dt$ at the point where x = -1 ?

(A) y - 3 = -3e(x + 1)

(B) y - 3 = -e(x + 1)

(C) y - 3 = 0

(D) y - 3 = -1/e(x + 1)

(E) y - 3 = 3e(x + 1)

---

**36.** Let *g* be the function defined by $g\left(x\right) = \int_{-1}^{x} \frac{t^3 - t^2 - 6t}{\sqrt{t^2 + 7}} dt.$ On which of the following intervals is *g* decreasing?

## Integrals 1 Test Review

(A) $x \leq -2 \, and \, 0 \leq x \leq 3$

(B) $x \leq -2 \, and \, x \geq 3$

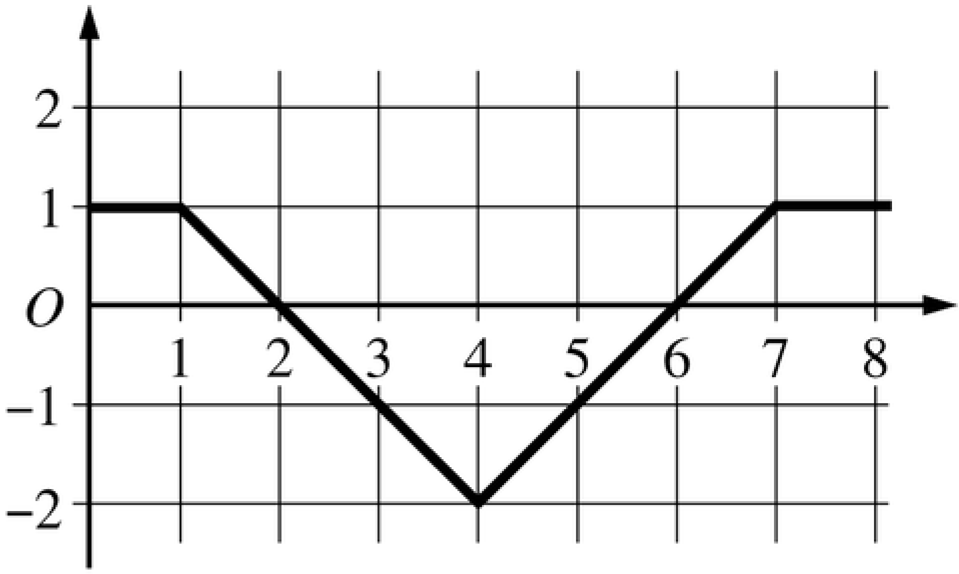
(C) $-2 \leq x \leq 0 \, and \, x \geq 3$

(D) $-2 \leq x \leq 3$

(E) $x \leq -1$

---

**37.**




Graph of $f$

The graph of the function *f* in the figure above consists of four line segments. Let *g* be the function defined by $g(x) = \int_0^x f(t)\ dt$. Which of the following is an equation of the line tangent to the graph of *g* at $x = 5$ ?

## Integrals 1 Test Review

(A) $y+1=x-5$

(B) $y-2=x-5$

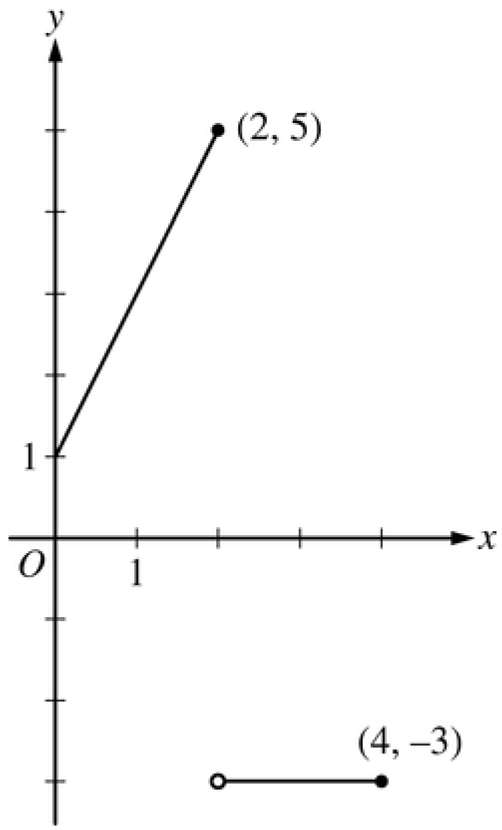
(C) $y-2=-1\left(x-5\right)$

(D) $y+2=x-5$

(E) $y+2=-1\left(x-5\right)$

---

**38.**




Graph of $f$

The graph of *f* is shown above for $0\leq x\leq 4$. What is the value of $\int_0^4 f\left(x\right)\ dx$ ?

## Integrals 1 Test Review

(A) -1

(B) 0

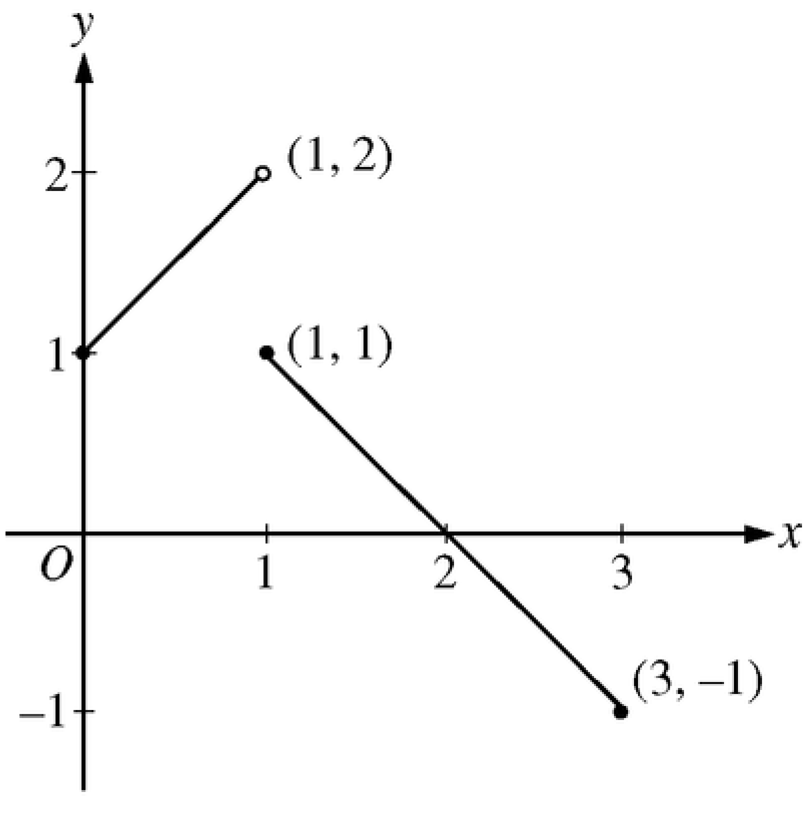
(C) 2

(D) 6

(E) 12

---

**39.**




Graph of $f$

The graph of the function $f$ consists of two line segments, as shown in the figure above. The value of $\int_0^3 |f(x)|\ dx$ is

## Integrals 1 Test Review

(A) $-\frac{3}{2}$

(B) $\frac{1}{2}$

(C) $\frac{3}{2}$

(D) $\frac{5}{2}$

(E) nonexistent

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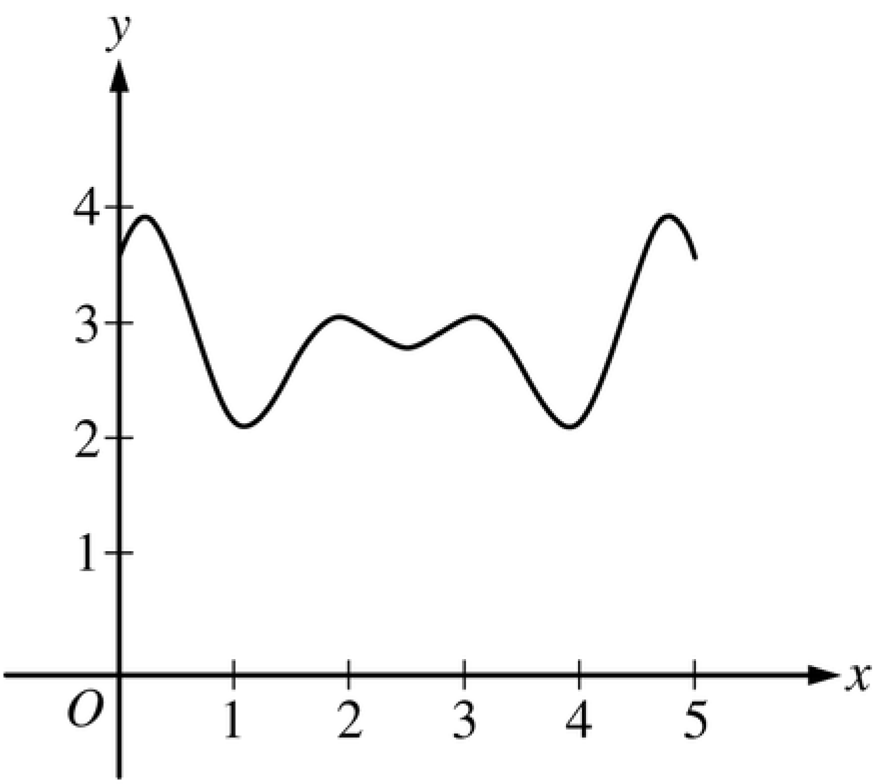
**40.**




Graph of $f'$

The graph of $f'$, the derivative of $f$, is shown in the figure above. If $f(0) = 20$, which of the following could be the value of $f(5)$ ?

## Integrals 1 Test Review

(A) 15

(B) 20

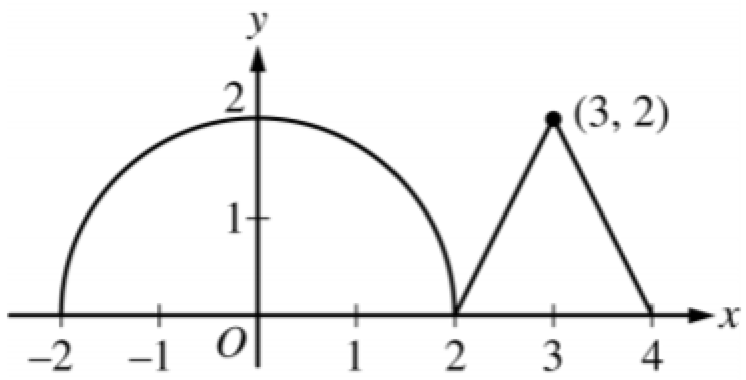
(C) 25

(D) 35

(E) 40

---

**41.**



Graph of $g'$

The graph of $g'$, the first derivative of the function $g$, consists of a semicircle of radius 2 and two line segments, as shown in the figure above. If $g(0) = 1$, what is $g(3)$ ?

(A) $\pi + 1$

(B) $\pi + 2$

(C) $2\pi + 1$

(D) $2\pi + 2$

## Integrals 1 Test Review

**42.** $\int_{-2}^{1} \left(8x^3 - 3x^2\right) dx =$

(A) -561

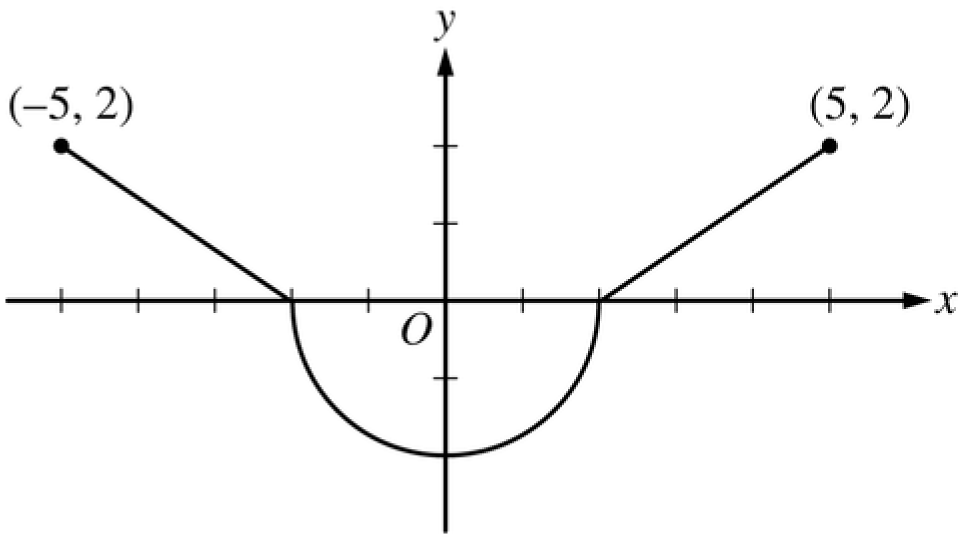
(B) -90

(C) -39

(D) 81

---

**43.**




Graph of $f\,'$

The graph of $f'$, the derivative of a function *f*, consists of two line segments and a semicircle, as shown in the figure above. If $f\,(2) = 1$, then $f\,(-5) =$

## Integrals 1 Test Review

(A) $2\pi - 2$

(B) $2\pi - 3$

(C) $2\pi - 5$

(D) $6 - 2\pi$

(E) $4 - 2\pi$

---

**44.**

$$\int (e^x + e)\, dx =$$

(A) $e^x + C$

(B) $2e^x + C$

(C) $e^x + e + C$

(D) $e^{x+1} + ex + C$

(E) $e^x + ex + C$

---

**45.** $\int 2^x\, dx =$

## Integrals 1 Test Review

(A) $2^x + C$

(B) $(ln\ 2)\ 2^x + C$

(C) $\frac{2^x}{\ln 2} + C$

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

---

**46.**

| $x$ | 0 | 2 | 4 | 6 |
|---|---|---|---|---|
| $f(x)$ | $-22$ | $-6$ | 2 | 2 |
| $f'(x)$ | 10 | 6 | 2 | $-2$ |

Selected values of the twice-differentiable function $f$ and its derivative $f'$ are given in the table above. What is the value of $\int_0^6 f'(x)\,dx$ ?

(A) $-12$

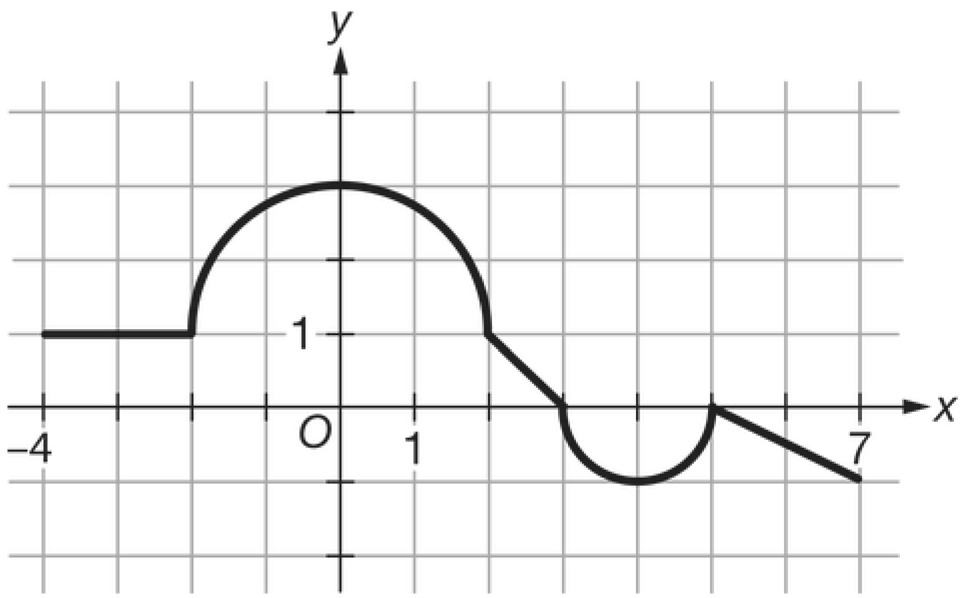
(B) 12

(C) 24

(D) 36

## Integrals 1 Test Review

**47.**




Graph of $f$

The graph of the function $f$ on the interval $-4 \leq x \leq 7$ consists of three line segments and two semicircles, as shown in the figure above. What is the value of $\int_{-4}^{7} f(x)\,dx$ ?

(A) $\frac{3}{2}\pi + \frac{3}{2}$

(B) $\frac{3}{2}\pi + \frac{11}{2}$

(C) $\frac{5}{2}\pi + \frac{7}{2}$

(D) $\frac{5}{2}\pi + \frac{15}{2}$

**48.** If $\int_{-1}^{3} (2g(x) + 4)\,dx = 22$ and $\int_{10}^{-1} g(x)\,dx = 12$, then $\int_{3}^{10} g(x)\,dx =$

## Integrals 1 Test Review

(A) $-21$

(B) $-15$

(C) $-9$

(D) 9

---

**49.**

| $x$ | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| $f(x)$ | 0 | 5 | 2 | –1 | –2 | 0 | 3 |

The function f is continuous on the closed interval [0, 6] and has values as shown in the table above. Using the intervals [0,2], [2,4], and [4,6], what is the approximation of $\int_0^6 f(x)dx$ obtained from a midpoint Riemann sum?

(A) 0

(B) 3

(C) 4

(D) 6

(E) 8

---

**50.** The average value of a function $f$ over the interval $[-1, 2]$ is $-4$, and the average value of $f$ over the interval $[2, 7]$ is 8. What is the average value of $f$ over the interval $[-1, 7]$ ?

## Integrals 1 Test Review

(A) $\frac{1}{2}$

(B) 2

(C) $\frac{7}{2}$

(D) 14

---

**51.** Let $f$ be the function given by $f(x) = \int_{10}^{x} \left(-t^2 + 2t + 3\right) dt$. On what intervals is $f$ increasing?

(A) $(-\infty, 1]$

(B) $[-1, 3]$

(C) $[1, \infty)$

(D) $(-\infty, -1]$ and $[3, \infty)$

---

**52.** Which of the following is a left Riemann sum approximation of $\int_{1}^{7} (4 \ln x + 2)\, dx$ with $n$ subintervals of equal length?

## Integrals 1 Test Review

(A) $\sum_{k=1}^{n}\left(4\ln\left(1+\frac{k-1}{n}\right)+2\right)\frac{1}{n}$

(B) $\sum_{k=1}^{n}\left(4\ln\left(\frac{6k}{n}\right)+2\right)\frac{6}{n}$

(C) $\sum_{k=1}^{n}\left(4\ln\left(1+\frac{6(k-1)}{n}\right)+2\right)\frac{6}{n}$

(D) $\sum_{k=1}^{n}\left(4\ln\left(1+\frac{6k}{n}\right)+2\right)\frac{6}{n}$

**53.** Which of the following is a left Riemann sum approximation of $\int_2^8 \cos\left(x^2\right)\,dx$ with $n$ subintervals of equal length?

(A) $\sum_{k=1}^{n}\left(\cos\left(2+\frac{k-1}{n}\right)^2\right)\frac{1}{n}$

(B) $\sum_{k=1}^{n}\left(\cos\left(\frac{6k}{n}\right)^2\right)\frac{6}{n}$

(C) $\sum_{k=1}^{n}\left(\cos\left(2+\frac{6(k-1)}{n}\right)^2\right)\frac{6}{n}$

(D) $\sum_{k=1}^{n}\left(\cos\left(2+\frac{6k}{n}\right)^2\right)\frac{6}{n}$