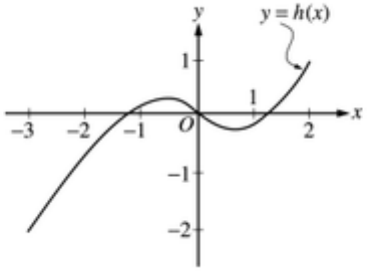
8.1-8.3 Multiple Choice Review

1.



The graph of the function h is shown in the figure above. Of the following, which has the greatest value?

(A) Average value of *h* over

(B) Average rate of change of *h* over [-3, 2] ✓

(C) $\int_{-3}^{2} h(x)\,dx$

(D) $\int_{-3}^{0} h(x)\,dx$

(E) *h'(0)*

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2. The velocity, in ft/sec, of a particle moving along the *x*-axis is given by the function $v(t) = e^t + te^t$. What is the average velocity of the particle from time $t = 0$ to time $t = 3$?

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(A) 20.086 ft/sec ✓

(B) 26.447 ft/sec

(C) 32.809 ft/sec

(D) 40.671 ft/sec

(E) 79.342 ft/sec

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3. What is the average value of $y = \frac{\cos x}{x^2+x+2}$ on the closed interval $[-1, 3]$?

(A) −0.085

(B) 0.090

(C) 0.183 ✓

(D) 0.244

(E) 0.732

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4. A particle moves along the *x*-axis. The velocity of the particle at time *t* is $6t - t^2$. What is the total distance traveled by the particle from time $t = 0$ to $t = 3$?

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(A) 3

(B) 6

(C) 9

(D) 18 ✔

(E) 27

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5. A particle moves along a line so that its acceleration for $t \geq 0$ is given by $a(t) = \frac{t+3}{\sqrt{t^3+1}}$. If the particle's velocity at $t = 0$ is 5, what is the velocity of the particle at $t = 3$?

(A) 0.713

(B) 1.134

(C) 6.134

(D) 6.710

(E) 11.710 ✔

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6. A particle moves along the *x*-axis with velocity given by $v(t) = 3t^2 - 4$ for time $t \geq 0$. If the particle is at position $x = -2$ at time *t* = 0, what is the position of the particle at the time $t = 3$?

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(A) 13 ✓

(B) 15

(C) 16

(D) 17

(E) 25

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7. A particle moves along the x-axis so that at any time $t > 0$, its velocity is given by $v(t) = 4 - 6t^2$. If the particle is at position $x = 7$ at $t = 1$ time, what is the position of the particle at time $t = 2$?

(A) -10

(B) -5

(C) -3 ✓

(D) 3

(E) 17

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8. A particle moves along the *x*-axis so that at any time t≥0 , its velocity is given by *v(t)*=sin(2*t*) . If the position of the particle at time $t = \frac{\pi}{2}$ is *x*=4 , what is the particle's position at time *t*=0 ?

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

(B) 2

(C) 3 ✔

(D) 5

(E) 8

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9. A particle moves along the x-axis so that at any time $t \geq 0$ the acceleration of the particle is $a(t) = e^{-2}t$ If at *t*=0 the velocity of the particle is $\frac{5}{2}$ and its position is $\frac{17}{4}$, then its position at any time *t*>0 is *x*(*t*)=

(A) $-\frac{e^{-2t}}{2} + 3$

(B) $\frac{e^{-2t}}{4} + 4$

(C) $4e^{-2t} + \frac{9}{2}t + \frac{1}{4}$

(D) $\frac{e^{-2t}}{2} + 3l + \frac{15}{4}$

(E) $\frac{e^{-2t}}{4} + 3t + 4$ ✔

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10. The acceleration of a particle moving along the *x*-axis at time *t* is given by $a(t) = 6t - 2$. If the velocity is 25 when *t*=3 and the position is 10 when *t*=1, then the position *x(t)*=

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(A) $9t^2 + 1$

(B) $3t^2 - 2t + 4$

(C) $t^3 - t^2 + 4t + 6$ ✓

(D) $t^3 - t^2 + 9t - 20$

(E) $36t^3 - 4t^2 - 77t + 55$

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11. Water is pumped into a tank at a rate of $r\,(t) = 30\left(1 - e^{-0.16t}\right)$ gallons per minute, where t is the number of minutes since the pump was turned on. If the tank contained 800 gallons of water when the pump was turned on, how much water, to the nearest gallon, is in the tank after 20 minutes?

(A) 380 gallons

(B) 420 gallons

(C) 829 gallons

(D) 1220 gallons ✓

(E) 1376 gallons

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12. A cup of tea is cooling in a room that has a constant temperature of 70 degrees Fahrenheit $(^\circ\mathrm{F})$. If the initial temperature of the tea, at time $t = 0$ minutes, is $200^\circ\mathrm{F}$ and the temperature of the tea changes at the rate $R\,(t) = -6.89e^{-0.053t}$ degrees Fahrenheit per minute, what is the temperature, to the nearest degree, of the tea after 4 minutes?

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(A) 175°F ✓

(B) 130°F

(C) 95°F

(D) 70°F

(E) 45°F

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13. The rate at which motor oil is leaking from an automobile is modeled by the function *L* defined by $L(t) = 1 + \sin(t^2)$ for time $t \geq 0$. $L(t)$ is measured in liters per hour, and *t* is measured in hours. How much oil leaks out of the automobile during the first half hour?

(A) 1.998 liters

(B) 1.247 liters

(C) 0.969 liters

(D) 0.541 liters ✓

(E) 0.531 liters

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14. During a rainfall, the depth of water in a rain gauge increases at a rate modeled by $R(t) = 0.5 + t\cos\left(\frac{\pi t^3}{80}\right)$, where t is the time in hours since the start of the rainfall and $R(t)$ is measured in centimeters per hour. How much did the depth of water in the rain gauge increase from $t = 0$ to $t = 3$ hours?

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(A) 1.233 cm

(B) 1.466 cm

(C) 1.966 cm

(D) 5.401 cm ✔

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15. A city is built around a circular lake that has a radius of 1 mile. The population density of the city is $f(r)$ people per square mile, where r is the distance from the center of the lake, in miles. Which of the following expressions gives the number of people who live within 1 mile of the lake?

(A) $2\pi \int_0^1 rf(r)dr$

(B) $2\pi \int_0^1 r(1+f(r))dr$

(C) $2\pi \int_0^2 r(1+f(r))dr$

(D) $2\pi \int_0^2 rf(r)dr$ ✔

(E) $2\pi \int_0^2 r(1+f(r))dr$

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16. The temperature in a room at midnight is 20 degrees Celsius. Over the next 24 hours, the temperature changes at a rate modeled by the differentiable function H, where $H(t)$ is measured in degrees Celsius per hour and time t is measured in hours since midnight. Which of the following is the best interpretation of $\int_0^6 H(t)dt$?

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(A) The temperature of the room, in degrees Celsius, at 6:00 A.M.

(B) The average temperature of the room, in degrees Celsius, between midnight and 6:00 A.M.

(C) The change in the temperature of the room, in degrees Celsius, between midnight and 6:00 A.M. ✔

(D) The rate at which the temperature in the room is changing, in degrees Celsius per hour, at 6:00 A.M.

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17. If $0 \le k < \frac{\pi}{2}$ 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

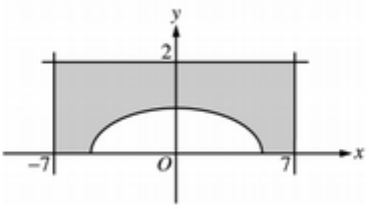
(B) 1.414

(C) 1.277

(D) 1.120 ✔

(E) 0.436

18.



The shaded region in the figure above is bounded by the graph of $y = \sqrt{\cos\left(\frac{\pi x}{10}\right)}$ and the lines $x = -7$, $x = 7$, and $y = 2$. What is the area of this region?

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(A) 6.372

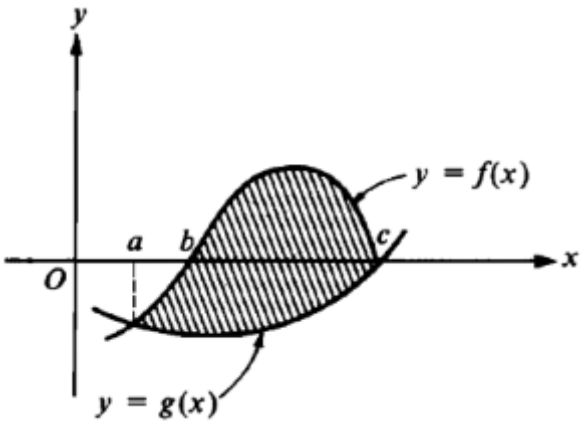
(B) 7.628

(C) 20.372 ✔

(D) 21.634

(E) 24.923

19.



The area of the shaded region in the figure above is represented by which of the following integrals?

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(A) $\int_a^c (|f(x)|-|g(x)|)dx$

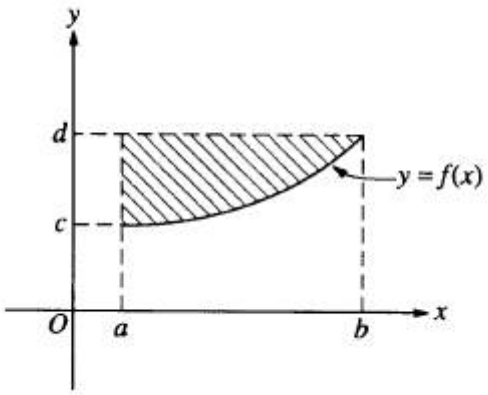
(B) $\int_b^c f(x)dx - \int_a^c g(x)dx$

(C) $\int_a^c (g(x)-f(x))dx$

(D) $\int_a^c (f(x)-g(x))dx$ ✔

(E) $\int_a^b (g(x)-f(x))dx + \int_b^c (f(x)-g(x))\,dx$

20.



Which of the following represents the area of the shaded region in the figure above?

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A $\int_{c}^{d} f(y)dy$

B $\int_{a}^{b} (d - f(x))dx$ ✔

C $f'(b) - f'(a)$

D $(b - a)[f(b) - f(a)]$

E $(d - c)[f(b) - f(a)]$

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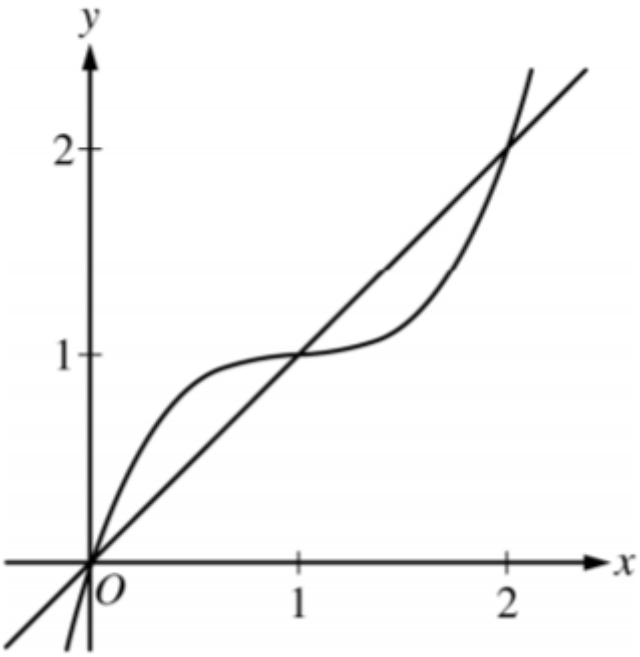
21.



The graphs of the function g and the line $y = x$ are shown in the figure above. The graphs intersect at the points $(0, 0)$, $(1, 1)$, and $(2, 2)$. Which of the following expressions give the area enclosed by the graphs?

I $\left|\int_0^2 (x - g(x))dx\right|$

II $\int_0^2 \left|x - g(x)\right|dx$

III. $\int_0^1 (g(x) - x)dx + \int_1^2 (x - g(x))dx$

(A) II only

(B) III only

(C) I and II only

(D) II and III only ✓

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22. What is the volume of the solid generated when the region bounded by the graph of $y = 2x$, the horizontal line $y = 2$, and the y-axis is revolved about the horizontal line $y = 2$?

(A) π

(B) $\frac{4\pi}{3}$ ✓

(C) $\frac{8\pi}{3}$

(D) $\frac{16\pi}{3}$

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23. Let R be the region in the first quadrant bounded by the graph of $y = \sin x$, the x-axis, and the vertical line $x = 1$. Which of the following gives the volume of the solid generated when region R is revolved about the vertical line $x = 1$?

(A) $\pi \int_0^{\sin 1} (1 - \arcsin y)^2 \, dy$ ✓

(B) $\pi \int_0^{1} (1 - \arcsin y)^2 \, dy$

(C) $\pi \int_0^{\sin 1} (1 - \arcsin y) \, dy$

(D) $\pi \int_0^{\sin 1} \left(1 - (\arcsin y)^2\right) \, dy$

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24. Let R be the region in the first quadrant bounded by the graph of $y = \tan x$, the x-axis, and the vertical line $x = 1$. Which of the following gives the volume of the solid generated when region R is revolved about the vertical line $x = 1$?

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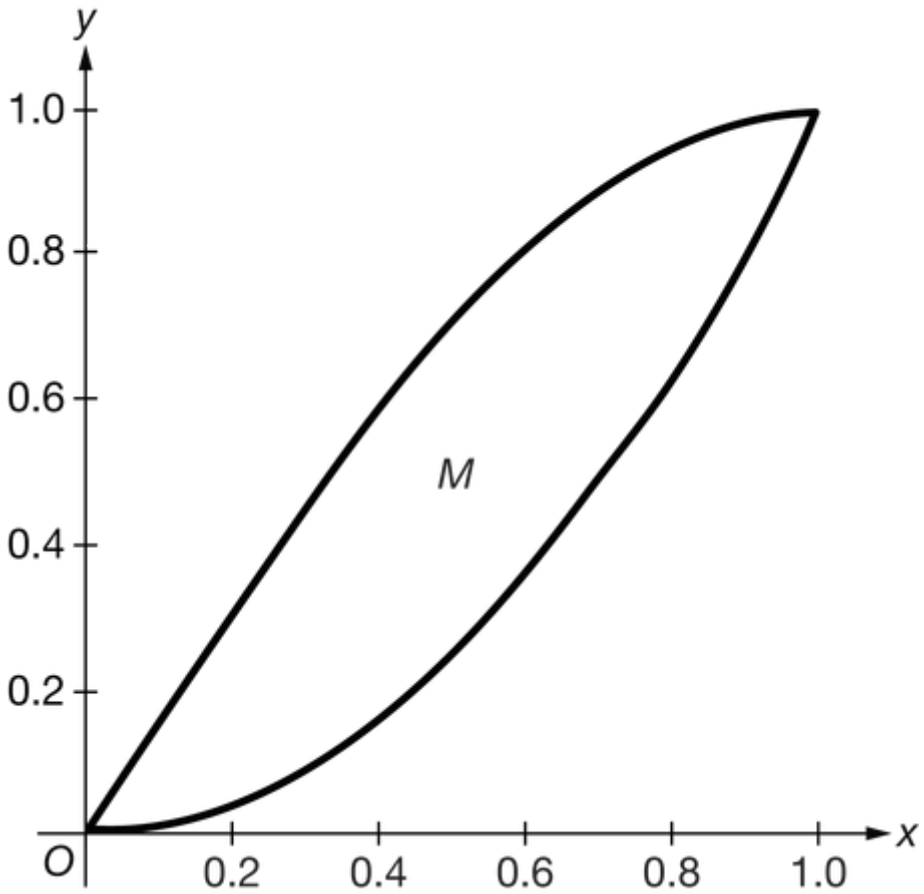
(A) $\pi \int_0^{\tan 1} (1 - \arctan y)^2 \, dy$ ✓

(B) $\pi \int_0^{1} (1 - \arctan y)^2 \, dy$

(C) $\pi \int_0^{\tan 1} (1 - \arctan y) \, dy$

(D) $\pi \int_0^{1} \left(1^2 - (\arctan y)^2\right) \, dy$

25.



Let M be the region in the first quadrant bounded by the graphs of $y = \sin\left(\frac{\pi x}{2}\right)$ and $y = x^2$. What is the volume of the solid generated when region M is revolved around the vertical line $x = 2$?

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(A) 0.308

(B) 0.953

(C) 0.976

(D) 2.836 ✔

26. Let M be the region in the first quadrant bounded above by the graph of $y = 3x$ and below by the graph of $y = x^2$. Which of the following gives the volume of the solid generated when region M is revolved about the vertical line $x = -3$?

(A) $\pi \int_0^9 \left(\left(\sqrt{y} + 3 \right) - \left(\frac{y}{3} + 3 \right) \right)^2 dy$

(B) $\pi \int_0^9 \left(\sqrt{y} - \frac{y}{3} \right) dy$

(C) $\pi \int_0^9 \left(\left(\sqrt{y} \right)^2 - \left(\frac{y}{3} \right)^2 \right) dy$

(D) $\pi \int_0^9 \left(\left(\sqrt{y} + 3 \right)^2 - \left(\frac{y}{3} + 3 \right)^2 \right) dy$ ✔