1. $\lim_{n\to\infty} \frac{5}{n} \sum_{i=1}^{n} \left(1 + \frac{2i}{n}\right)^2 =$

(a) $\frac{65}{3}$ (correct)

(b) $\frac{61}{3}$

(c) $\frac{67}{3}$

(d) $\frac{59}{3}$

(e) $\frac{58}{3}$

2. If $\int_5^0 f(x)\,dx = -15$ and $\int_0^2 f(x)\,dx = 8$, then $\int_2^5 3f(x) =$

(a) 21 (correct)

(b) 24

(c) 22

(d) -7

(e) 7

3. $\displaystyle\int_{-3}^{3}\left(\frac{\sinh x}{1+\cosh x}+\sqrt{9-x^2}\right)\,dx =$

(a) $\dfrac{9\pi}{2}$ (correct)

(b) $\dfrac{9\pi}{4}$

(c) $e+\dfrac{9\pi}{2}$

(d) $e+\dfrac{9\pi}{4}$

(e) 0

4. Using four rectangle and taking the sample points to be the midpoints, then the estimate of the area under the graphs of $f(x) = 1 - x^2$ from $x = -1$, to $x = 1$ is equal to

(a) $\dfrac{11}{8}$ (correct)

(b) $\dfrac{9}{8}$

(c) $\dfrac{7}{8}$

(d) $\dfrac{13}{8}$

(e) $\dfrac{5}{8}$

5. If $g(x) = \int_{1-2x}^{1+2x} t \sin t \, dt$, then $g'(0) =$

(a) $4\sin(1)$ (correct)

(b) $2\sin(1)$

(c) 0

(d) $3\sin(1)$

(e) $-2\sin(1)$

6. A particle moves along a line so that its velocity at time t is $v(t) = t^2 - 2t - 3\, m/s$. Then the distance traveled during the time period $2 \leq t \leq 4$ is

(a) 4 (correct)

(b) 8

(c) 10

(d) 6

(e) 9

7. $\displaystyle\int_1^2 \left(\frac{1+x}{x}\right)^2 dx =$

(a) $\dfrac{3}{2} + \ln 4$ (correct)

(b) $\dfrac{3}{2} - \ln 4$

(c) $\dfrac{1}{2} - \ln 4$

(d) $\dfrac{1}{2} + \ln 4$

(e) $\dfrac{1}{4} + \ln 2$

8. $\displaystyle\int_0^{\frac{3\pi}{2}} |\sin x|\, dx =$

(a) 3 (correct)

(b) 1

(c) 0

(d) 2

(e) 4

9. $\displaystyle\int \frac{dx}{\sqrt{1-x^2}\sin^{-1}x} =$

(a) $\ln|\sin^{-1}x| + c$ (correct)

(b) $\sin^{-1}x \cdot \sqrt{1-x^2} + c$

(c) $2\ln|\sin^{-1}x| + c$

(d) $2\sin^{-1}x + c$

(e) $\dfrac{(\sin^{-1}x)^2}{2} + c$

10. $\displaystyle\int x^5\sqrt{\frac{1+x^2}{x^4}}\,dx =$

(a) $\frac{1}{5}(x^2+1)^{5/2} - \frac{1}{3}(x^2+1)^{3/2} + c$ (correct)

(b) $\frac{1}{5}(x^2+1)^{5/2} + \frac{2}{3}(x^2+1)^{3/2} + c$

(c) $\frac{-1}{5}(x^2+1)^{5/2} - \frac{2}{3}(x^2+1)^{3/2} + c$

(d) $\frac{-1}{5}(x^2+1)^{5/2} - \frac{4}{3}(x^2+1)^{3/2} + c$

(e) $\frac{2}{5}(x^2+1)^{5/2} - \frac{2}{3}(x^2+1)^{3/2} + c$

11. If f is continuous and $\int_0^4 f(x)\,dx = 10$, then $\int_0^2 f(2x)\,dx + \int_0^2 xf(x^2)\,dx =$

(a) 10 (correct)

(b) 5

(c) 8

(d) 7

(e) 20

12. The area of the region enclosed by the curves $y = x^4$ and $y = 2 - |x|$ is equal to

(a) $\frac{13}{5}$ (correct)

(b) $\frac{11}{5}$

(c) $\frac{17}{5}$

(d) $\frac{19}{5}$

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

13. The area of the region enclosed by the curves

$$y = \sqrt{x},\ y = \frac{x}{2} \text{ and } x = 9$$

is given by

(a) $\displaystyle\int_0^4 \left(\sqrt{x} - \frac{x}{2}\right) dx + \int_4^9 \left(\frac{x}{2} - \sqrt{x}\right) dx$ (correct)

(b) $\displaystyle\int_0^4 \left(\frac{x}{2} - \sqrt{x}\right) dx + \int_4^9 \left(\sqrt{x} - \frac{x}{2}\right) dx$

(c) $\displaystyle\int_0^9 \left(\sqrt{x} - \frac{x}{2}\right) dx$

(d) $\displaystyle\int_0^9 \left(\frac{x}{2} - \sqrt{x}\right) dx$

(e) $\displaystyle\int_0^4 \left(\sqrt{x} + \frac{x}{2}\right) dx + \int_4^9 \left(\frac{x}{2} - \sqrt{x}\right) dx$

14. The base of a solid is the region in the first quadrant bounded by the curves $y = \sin x$, $x = 0$, $x = \pi$ and $y = 0$. If the cross sections perpendicular to the x-axis are squares, then the volume of the solid is given by the integral

(a) $\displaystyle\int_0^\pi \sin^2 x\, dx$ (correct)

(b) $\displaystyle\pi \int_0^\pi \sin^2 x\, dx$

(c) $\displaystyle 2\pi \int_0^\pi \sin^2 x\, dx$

(d) $\displaystyle 2\pi \int_0^\pi \sin x\, dx$

(e) $\displaystyle\pi \int_0^\pi \sin x\, dx$

15. The volume of the solid obtained by rotating the region bounded by the curves $y = \ln x$, $y = 1$, $y = 2$, $x = 0$ about the y-axis is equal to

(a) $\frac{\pi}{2}(e^4 - e^2)$ (correct)

(b) $\frac{\pi}{2}(e^3 - e)$

(c) $\frac{\pi}{4}(e^4 - e^2)$

(d) $\frac{\pi}{4}(e^3 - e)$

(e) $\frac{\pi}{3}(e^2 - e)$

16. Using cross-sections method, the volume of the solid obtained by rotating the region bounded by the curves $y = \sqrt{x}$ and $y = x$ about the line $y = -1$ is given by the integral

(a) $\pi \int_0^1 [(\sqrt{x} + 1)^2 - (x + 1)^2]\, dx$ (correct)

(b) $\pi \int_0^1 [(\sqrt{x} - 1)^2 - (x - 1)^2]\, dx$

(c) $\pi \int_0^1 (x - x^2)\, dx$

(d) $2\pi \int_0^1 [(\sqrt{x} + 1)^2 - (x + 1)^2]\, dx$

(e) $2\pi \int_0^1 [(\sqrt{x} - 1)^2 - (x + 1)^2]\, dx$

17. Using the cylindrical shells method, the volume of the solid obtained by rotating the region enclosed by $y = x^3$, $y = 8$ and $x = 0$ about the line $x = 3$ is

(a) $\dfrac{264\pi}{5}$ (correct)

(b) $\dfrac{266\pi}{5}$

(c) $\dfrac{268\pi}{5}$

(d) $\dfrac{262\pi}{5}$

(e) $\dfrac{271\pi}{5}$

18. Using the cylindrical shells method, and integral for the volume of the solid obtained by rotating the region bounded by the curves $y = \tan x$, $y = 0$ and $x = \dfrac{\pi}{4}$ about the y-axis is

(a) $2\pi \int_0^{\frac{\pi}{4}} x \tan x \, dx$ (correct)

(b) $2\pi \int_0^{\frac{\pi}{4}} \tan x \, dx$

(c) $\pi \int_0^{\frac{\pi}{4}} x \tan x \, dx$

(d) $2\pi \int_0^{\frac{\pi}{4}} (1 - x) \tan x \, dx$

(e) $2\pi \int_0^{\frac{\pi}{4}} (2 - x) \tan x \, dx$