1. If f is an integrable function, then

$$\lim_{n\to\infty} \sum_{i=1}^{n} \frac{6}{n} f\left(1 + \frac{6i}{n}\right) =$$

(a) $\int_1^7 f(x)\,dx$

(b) $\int_1^6 f(x)\,dx$

(c) $\int_1^5 6f(x)\,dx$

(d) $\int_1^7 6f(x)\,dx$

(e) $\int_1^6 6f(x)\,dx$

2. Using four rectangles and taking the sample points to be right endpoints, then the estimate of the area under the graph of $f(x) = 2 - x^2$ from $x = -1$ to $x = 1$ is equal to

(a) $\frac{13}{4}$

(b) $\frac{11}{4}$

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

(d) $\frac{7}{4}$

(e) $\frac{5}{4}$

3. Which of the following statements is **False**?

(a) $\int_{-1}^{1} x^3 \sin x \, dx = 0$

(b) $\int_{-1}^{1} x^3 \cos x \, dx = 0$

(c) $\int_{-1}^{1} |x| \sin x \, dx = 0$

(d) $\int_{-1}^{1} |x| \tan x \, dx = 0$

(e) $\int_{-1}^{1} x \, |x| \, dx = 0$

4. If $\int_{1}^{10} f(x) \, dx = 5$ and $\int_{2}^{1} f(x) \, dx = 3$, then $\int_{2}^{10} (1 + f(x)) \, dx =$

(a) 16

(b) 15

(c) 14

(d) 12

(e) 10

5. $f(x) = \begin{cases} x+2 & \text{if} \quad -3 \le x \le -1 \\ x^2 & \text{if} \quad -1 < x \le 3 \end{cases}$, then $\int_{-2}^{0} f(x)\,dx =$

(a) $\frac{5}{6}$

(b) $\frac{7}{6}$

(c) $\frac{11}{6}$

(d) $\frac{13}{6}$

(e) $\frac{1}{6}$

6. $\int (e^x + x^{e-1})\,dx =$

(a) $e^x + \frac{1}{e}x^e + c$

(b) $e^x - x^e + c$

(c) $e^x + x^{e-1} + c$

(d) $e^x - x^{e-1} + c$

(e) $e^x + x^e + c$

7. $\int \frac{(1-\ln\, x)^4}{x}\, dx =$

(a) $-\frac{1}{5}(1-\ln\, x)^5 + c$

(b) $(1-\ln\, x)^5 + c$

(c) $\frac{1}{5}(1+\ln\, x)^5 + c$

(d) $(1+\ln\, x)^5 + c$

(e) $\frac{1}{5}(-1-\ln\, x)^5 + c$

8. $\int_{-1}^{0} (x+1)\sqrt[3]{x+1}\, dx =$

(a) $\frac{3}{7}$

(b) $\frac{4}{7}$

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

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

(e) $\frac{1}{7}$

9. $\displaystyle\int_0^1 \frac{\sin(\tan^{-1} x)}{1+x^2}\,dx =$

(a) $1 - \dfrac{\sqrt{2}}{2}$

(b) $2 - \dfrac{\sqrt{2}}{2}$

(c) $2 + \dfrac{\sqrt{2}}{2}$

(d) $1 - \sqrt{2}$

(e) $1 + \sqrt{2}$

10. $\displaystyle\int_{-\pi}^{\pi} \sqrt{\pi^2 - x^2}\,dx =$

(a) $\dfrac{1}{2}\pi^3$

(b) $\dfrac{1}{2}\pi^2$

(c) π^3

(d) $\dfrac{1}{4}\pi^3$

(e) 0

11. $\dfrac{d}{dx}\left[\displaystyle\int_{e^{-x}}^{e^{x}} \ln t\,dt\right] =$

(a) $x\left(e^{x} - e^{-x}\right)$

(b) 0

(c) $2x\,e^{x}$

(d) $e^{x} + e^{-x}$

(e) $x\,e^{x} - 1$

12. A particle moves along a line so that its velocity at time t is $v(t) = t - t^3$ (measured in meters per second). The distance traveled, in meters, during the time period $0 \le t \le 2$ is equal to

(a) $\dfrac{5}{2}$

(b) $\dfrac{3}{2}$

(c) $\dfrac{1}{2}$

(d) $\dfrac{7}{2}$

(e) $\dfrac{9}{2}$

13. $\displaystyle\int_0^{\pi/6} (\sin\, x + \cos\, x)^2\, dx =$

(a) $\dfrac{\pi}{6} + \dfrac{1}{4}$

(b) $\dfrac{\pi}{6} + \dfrac{\sqrt{3}}{2}$

(c) $\dfrac{\pi}{6} - \dfrac{\sqrt{3}}{2}$

(d) $\dfrac{\pi}{6} - \dfrac{1}{2}$

(e) $\dfrac{\pi}{6} + \dfrac{\sqrt{3}}{4}$

14. $\displaystyle\int_1^{\sqrt{2}} x^3 \sqrt{x^2 - 1}\, dx =$

(a) $\dfrac{8}{15}$

(b) $\dfrac{2}{15}$

(c) $\dfrac{11}{15}$

(d) $\dfrac{7}{15}$

(e) $\dfrac{13}{15}$

15. $\int \frac{x-1}{3+x^2}\,dx =$

(a) $\frac{1}{2}\ln(x^2+3) - \frac{1}{\sqrt{3}}\tan^{-1}\left(\frac{x}{\sqrt{3}}\right) + c$

(b) $\frac{1}{2}\ln(x^2+3) - \frac{1}{3}\tan^{-1}\left(\frac{x}{\sqrt{3}}\right) + c$

(c) $\frac{1}{2}\ln(x^2+3) - \tan^{-1}\left(\frac{x}{\sqrt{3}}\right) + c$

(d) $\ln(x^2+3) - \frac{1}{\sqrt{3}}\tan^{-1}\left(\frac{x}{\sqrt{3}}\right) + c$

(e) $\ln(x^2+3) - \frac{1}{3}\tan^{-1}\left(\frac{x}{\sqrt{3}}\right) + c$

16. The area of the region enclosed by the curves

$$y = 6 - x^2 \text{ and } y = 2$$

is equal to

(a) $\frac{32}{3}$

(b) $\frac{31}{3}$

(c) $\frac{29}{3}$

(d) $\frac{28}{3}$

(e) $\frac{20}{3}$

17. The area enclosed by the curves $y = \tan^{-1} x$ and $y = \frac{\pi}{4} x^3$ is given by

(a) $2\int_0^1 \left(\tan^{-1} x - \frac{\pi}{4} x^3\right) dx$

(b) $\int_{-1}^1 \left(\tan^{-1} x - \frac{\pi}{4} x^3\right) dx$

(c) $\int_{-1}^1 \left(\frac{\pi}{4} x^3 - \tan^{-1} x\right) dx$

(d) $2\int_0^{\pi/4} \left(\tan^{-1} x - \frac{\pi}{4} x^3\right) dx$

(e) $2\int_0^{\pi/4} \left(\frac{\pi}{4} x^3 - \tan^{-1} x\right) dx$

18. The area of the region enclosed by

$$x = 8 - y^2 \text{ and } x = 2y$$

is

(a) 36

(b) 27

(c) 48

(d) 30

(e) 32

19. If $f(x) = \int_0^{2x} (3^x + e^{t^2})\, dt$, then $f'(1) =$

(a) $6(1 + \ln 3) + 2e^4$

(b) $3(1 + \ln 3) + 2e^4$

(c) $6(1 + \ln 3) + 4e^4$

(d) $3(1 + \ln 3) + 4e^4$

(e) $3(1 + \ln 3) + 6e^4$

20. The area of the region enclosed by the two curves $x = 2y^2$ and $x = y^4 - 2y^2$ is

(a) $\frac{128}{15}$

(b) $\frac{191}{15}$

(c) $\frac{328}{15}$

(d) $\frac{139}{15}$

(e) $\frac{556}{15}$