1. The **estimated area** under the graph of $f(x) = 20 - 2x^2$ from $x = -2$ to $x = 3$ using **five approximating rectangles** and **right end-points** is

(a) 70

(b) 75

(c) 80

(d) 90

(e) 60

2. The value of the integral $\int_0^2 (4+\sqrt{4-x^2})dx$ by interpreting it in terms of areas is

(a) $8 + \pi$

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

(c) $8 + \dfrac{\pi}{4}$

(d) $6 + 2\pi$

(e) $4 + 2\pi$

3. If $\int_{-1}^{6} f(x)dx = 12$, $\int_{-1}^{4} f(x)dx = 16$ and $\int_{5}^{6} f(x)dx = -18$, then $\int_{4}^{5} f(x)dx$ is equal to

(a) 14

(b) 10

(c) 22

(d) -10

(e) 28

4. The value of the integral $\int_{-\pi}^{\pi} \frac{\sin x}{1 + x^2 + x^4}\, dx$ is

(a) 0

(b) -2

(c) -1

(d) 1

(e) 2

5. The volume of the solid obtained by rotating the region bounded by the curves
$y = \sqrt{x-1}$, $y = 0$, and $x = 5$ about x-axis is equal to

(a) 8π

(b) 6π

(c) 10π

(d) 4π

(e) 2π

6. The integral $\int_0^{\pi/2} \pi[(1+\cos x)^2 - 1^2]\,dx$ represents the volume of the solid obtained by rotating the region bounded by

(a) $y = 1+\cos x,\ y = 1,\ x = 0,$ and $x = \pi/2$ about the x-axis

(b) $y = (1+\cos x)^2,\ y = 1,\ x = 0,$ and $x = \pi/2$ about the x-axis

(c) $y = 1+\cos x,\ y = 0,\ x = 0,$ and $x = \pi/2$ about the x-axis

(d) $y = 2+\cos x,\ y = 1,\ x = 0,$ and $x = \pi/2$ about the x-axis

(e) $y = 1-\cos x,\ y = 1,\ x = 0,$ and $x = \pi/2$ about the x-axis

7. The value of $\int_1^2 \frac{6+u+u^2}{u^3} du$ is equal to

(a) $\frac{11}{4} + \ln 2$

(b) $\ln 2 - \frac{5}{6}$

(c) $\ln 2 + 4$

(d) $\frac{15}{2}$

(e) 16

8. The value of $\int_0^1 x(\sqrt[3]{x} + \sqrt[4]{x})dx$ is

(a) $\frac{55}{63}$

(b) $\frac{1}{63}$

(c) $\frac{11}{63}$

(d) $\frac{1}{16}$

(e) $\frac{13}{16}$

9. The integral $\int \frac{1+x}{1+x^2}\,dx$ is equal to

(a) $\tan^{-1} x + \frac{1}{2}\ln(x^2+1) + C$

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

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

(d) $\tan^{-1}(x^2+1) + \ln(x^2+1) + C$

(e) $\tan^{-1}(\ln(x^2+1)) + C$

10. Let $f(x) = \begin{cases} x & \text{f} \quad -\pi \le x \le 0 \\ \sin x & \text{if} \quad 0 < x \le \pi. \end{cases}$ Then the value of $\int_{-\pi}^{\pi} f(x)dx$ is

(a) $\dfrac{4-\pi^2}{2}$

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

(c) $\dfrac{\pi^2}{2} - 5$

(d) $\dfrac{8-\pi^2}{4}$

(e) $2\pi - \pi^2$

11. Let $y = \int_{\sin x}^{x^2} \tan(u^3)du$. Then $\dfrac{dy}{dx}$ is

(a) $2x\tan(x^6) - \cos x \tan(\sin^3 x)$

(b) $\sec^2(x^2) - \sec^2(\sin^3 x)$

(c) $\sec(x^2)\tan(x^2) - \sec(\sin^3 x)\tan(\sin^3 x)$

(d) $\tan(x^6) - \tan(\sin^3 x)$

(e) $\tan(x^3)(x^2 - \sin x)$

12. If $G(u) = \int_1^u g(x)dx$ where $g(x) = \int_1^{x^2} \dfrac{\sqrt{9+t^2}}{t}\, dt$, then $G''(2)$ is equal to

(a) 5

(b) $\sqrt{\pi}$

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

(d) $\dfrac{\sqrt{\pi}}{2} - \sqrt{10}$

(e) 25

13. The value of $\int_0^{3\pi/2} |\sin x| dx$ is

(a) 3

(b) 2

(c) 1

(d) 0

(e) -1

14. The value of $\int_e^{e^2} \frac{dx}{x \ln x}$ is equal to

(a) $\ln 2$

(b) 1

(c) e

(d) $2 \ln 3$

(e) $-1 + \ln 2$

15. The limit $\lim_{t \to 0} (1 + 2t)^{3/t}$ is equal to

(a) e^6

(b) $e^{3/2}$

(c) e^2

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

(e) 6

16. The value of $\int_1^e \frac{\cos(\ln x)}{x}\, dx$ is

(a) $\sin 1$

(b) $\cos 1$

(c) $\ln(1 + e)$

(d) $\sin(\ln 1)$

(e) $\cos(\ln 1)$

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

(a) $\int_{-1}^{0}(2 + x - x^2)dx + \int_{0}^{1}(2 - x - x^2)dx$

(b) $\int_{-1}^{0}(2 - x - x^2)dx + \int_{0}^{1}(2 + x - x^2)dx$

(c) $\int_{-1}^{1}(2 - x^2 - x)dx$

(d) $\int_{-1}^{1}(2 - x^2 + x)dx$

(e) $\int_{-\sqrt{2}}^{\sqrt{2}}(2 - x^2 - x)dx$

18. The area of the region enclosed by the graphs of $x = y + 1$ and $x = (y - 1)^2$ is equal to

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

(b) 4

(c) $\frac{11}{2}$

(d) 5

(e) 6

19. The area of the region enclosed by the graphs of $y = \sin x,\ y = \sin 2x,\quad x = 0$ and $x = \dfrac{\pi}{3}$ is equal to

(a) $\dfrac{1}{4}$

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

(c) 0

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

(e) $\sqrt{3} - \dfrac{3}{2}$

20. The volume of the solid obtained by rotating the region bounded by the curves
$y = x^2$, and $x = y^2$ about the line $x = 1$ is equal to

(a) $\pi \int_0^1 ((1 - y^2)^2 - (1 - \sqrt{y})^2) dy$

(b) $\pi \int_0^1 ((1 - y^2)^2 - (1 - y)^2) dy$

(c) $\pi \int_0^1 ((1 - \sqrt{y})^2 - (1 - y)^2) dy$

(d) $\pi \int_0^1 (y^2 - \sqrt{y})^2 \, dy$

(e) $\pi \int_0^1 (y^2 - y) dy$