1. Using three approximating rectangles and the midpoints rule, an estimate of the area under the graph of $y = x^2 + 3$ from $x = 1$ to $x = 7$ equal to

(a) 130

(b) 100

(c) 109

(d) 170

(e) 67

2. $$\lim_{n\to\infty} \sum_{i=1}^{n} \frac{2}{n} \left[\frac{1 + \frac{2i}{n}}{\left(1 + \frac{2i}{n}\right)^2 + 4} \right] =$$

(a) $\ln \sqrt{\frac{13}{5}}$

(b) $\ln \sqrt{\frac{19}{7}}$

(c) $\ln \sqrt{\frac{11}{3}}$

(d) $\ln \sqrt{\frac{21}{4}}$

(e) $\ln \sqrt{\frac{15}{7}}$

3. Evaluate $\int_{-3}^{3}(|x| - \sqrt{9 - x^2})\, dx$

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

(b) $7 - \frac{7\pi}{2}$

(c) $9 - \frac{7\pi}{2}$

(d) $7 - \frac{9\pi}{2}$

(e) $5 - \frac{3\pi}{2}$

4. If $F(x) = \int_{2}^{x} f(t)\, dt$, where f is the function whose graph is given, which of the following values is largest?

(a) $F(2)$

(b) $F(1)$

(c) $F(0)$

(d) $F(3)$

(e) $F(4)$

5. Let $f(x) = \int_x^3 \sin(t^2)\,dt$; then $f'\left(\frac{\sqrt{\pi}}{2}\right) =$

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

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

(c) $\frac{-\sqrt{3}}{2}$

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

(e) 1

6. $\lim_{n\to\infty} \frac{2}{n^4}\left(1+8+27+\ldots+n^3\right)$

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

(b) $\frac{1}{3}$

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

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

(e) $\frac{1}{5}$

7. Let $v(t) = t^2 - t - 2$, be the velocity function (in meter per second) for a particle moving along a line. The total distance travelled by the particle during the period $0 \leq t \leq 3$

(a) $\frac{31}{6}$

(b) $\frac{15}{7}$

(c) $\frac{35}{9}$

(d) $\frac{41}{5}$

(e) $\frac{43}{6}$

8. $\int_0^{1/2} \frac{(1+t^2)\sqrt{1-t^2}}{1-t^4}\, dt =$

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

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

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

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

(e) $\frac{\pi}{2}$

9. The value of $I = \int_{-9}^{-1} (x+5)^8 \left(\sin(x+5) + (x+5)^{-6}\right) dx =$

(a) $\frac{128}{3}$

(b) $\frac{1}{3}$

(c) $\frac{94}{3}$

(d) $\frac{146}{3}$

(e) 0

10. If f is an **even** and integrable function such that $\int_{-3}^{0} f(x)\,dx = 5$, and $\int_{3}^{10} f(x)\,dx = 7$. Then $\int_{-3}^{10} f(x)\,dx =$

(a) 17

(b) 10

(c) 24

(d) 15

(e) 19

11. $\int_0^{\pi/2} (\cos\, x)\, \sin(\sin\, x)\, dx =$

(a) $1 - \cos\, 1$

(b) $\sin\, 1 + 1$

(c) $\cos\, 1 - \sin\, 1$

(d) 1

(e) 0

12. $\int_0^{1} (x-1)^2\, e^{(x-1)^3}\, dx =$

(a) $\frac{1}{3}\left(1 - \frac{1}{e}\right)$

(b) $\frac{1}{15} + e$

(c) $\frac{1}{3e} - 1$

(d) $\frac{1}{3} + e$

(e) $\frac{e^2}{6} - 1$

13. $\displaystyle\int_0^{\pi/3} \frac{\sin\,\theta + \sin\,\theta\,\tan^2\,\theta}{\sec^2\,\theta}\,d\theta$

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

(b) $\dfrac{5}{12}$

(c) 2

(d) 1

(e) 0

14. If $\int \sin^3 x\,dx = g(x) + \dfrac{1}{3}\cos^3\,x + C$,
where C is a constant, then $g(x) =$

(a) $-\cos\,x$

(b) $\sin\,x$

(c) $\sec\,x - 3\,\csc\,x$

(d) $\tan\,x$

(e) $-\cot\,x$

15. $\int \sqrt[4]{x^4+1}\, x^7\, dx$

(a) $\frac{1}{9}(x^4+1)^{9/4} - \frac{1}{5}(x^4+1)^{5/4} + C$

(b) $\frac{5}{9}(x^4+1)^{9/4} + \frac{4}{5}(x^4+1)^{5/4} + C$

(c) $\frac{1}{5}(x^4+1)^{9/4} - \frac{1}{9}(x^4+1)^{5/4} + C$

(d) $\frac{9}{4}(x^4+1)^{9/4} + \frac{4}{5}(x^4+1)^{5/4} + C$

(e) $(x^4+1)^{9/4} - (x^4+1)^{5/4} + C$

16. The area of the region enclosed by the curves $y = \sin x$ and $y = \cos 2x$ from $x = 0$ to $x = \frac{\pi}{2}$ equals to

(a) $\frac{3\sqrt{3}}{2} - 1$

(b) $\sqrt{3} + 1$

(c) $\sqrt{5} + 7$

(d) $\frac{2\sqrt{5}}{3} - 1$

(e) $2\sqrt{5} + 3\sqrt{3}$

17. Which one of the following integral represent the area of the shaded region given below?

(a) $\int_0^3 2y(3-y)\,dy$

(b) $\int_{-3}^3 (\sqrt{x}-\sqrt{x+1})\,dx$

(c) $\int_{-3}^3 2y(y-4)\,dy$

(d) $\int_{-3}^3 y(3-y)\,dy$

(e) $\int_0^3 (1+2y+y^2)\,dy$

18. If the base of a solid S is the enclosed area between $y=1-x$, the y-axis and the x-axis where the cross-sections perpendicular to the x-axis are squares, then the volume of the described solid S equals to

(a) $\frac{1}{3}$

(b) $\frac{1}{4}$

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

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

(e) $\frac{1}{5}$

19. The volume of the solid obtained by rotating the region enclosed by $x = y^2$ and $x = y$ about the line $y = -1$ is:

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

(b) $\dfrac{3\pi}{5}$

(c) $\dfrac{96\pi}{5}$

(d) $\dfrac{\pi}{3}(1 - e)$

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

20. The volume of the solid obtained by rotating the region bounded by $y = \ln x$, $y = 1$, $y = 2$ and $x = 0$ about the y-axis

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

(b) $\dfrac{3\pi}{2}(e - 1)$

(c) $\dfrac{\pi}{4}(e^2 - 3)$

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

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