1. The volume of the solid obtained by rotating the region bounded by $xy = 1, x = 0, y = 1, y = 3$ and revolved about the x-axis is

(a) $4\,\pi$

(b) $8\,\pi$

(c) $2\,\pi$

(d) $6\,\pi$

(e) $10\,\pi$

2. If the region bounded by the curves $y = \sin\, x$ and $y = \cos\, x$ for $0 \leq x \leq \dfrac{\pi}{4}$, is revolved about the line $x = \pi$, then the volume of the generated solid is given by

(a) $2\,\pi \int_0^{\pi/4} (\pi - x)(\cos\, x - \sin\, x)\, dx$

(b) $2\,\pi \int_0^{\pi/4} (x - \pi)(\cos\, x - \sin\, x)\, dx$

(c) $2\,\pi \int_0^{\pi/4} (\pi - 2x)(\sin\, x - \cos\, x)\, dx$

(d) $2\,\pi \int_0^{\pi/4} (x + \pi)(\sin\, x - \cos\, x)\, dx$

(e) $2\,\pi \int_0^{\pi/4} (\pi + x)(\sin\, x + \cos\, x)\, dx$

3. The sum of the numbers c for which the average value of $f(x) = 9x^2 + 4x + 3$ becomes 4 on the interval $[0, c]$ is

(a) 1/3

(b) 1/5

(c) 1/4

(d) 0

(e) 1/6

4. $\int_0^{\pi/2} \cos(5\,\theta)\,\cos(10\,\theta)\,d\theta =$

(a) $\frac{1}{15}$

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

(c) $\frac{1}{10}$

(d) $\frac{1}{50}$

(e) $\frac{1}{20}$

5. If $I = \int_1^e \ln^2(x)\,dx$, then I is equal to

(a) $e - 2$

(b) $e + 2$

(c) e

(d) 2

(e) $2e$

6. If $f(x) = \dfrac{9x^2+1}{x^3-x^2} = \dfrac{A}{x} + \dfrac{B}{x^2} + \dfrac{C}{x-1}$ then $A + B + C =$

(a) 8

(b) 10

(c) 12

(d) 9

(e) 11

7. Let $I = \int (e^{a \ln x} + e^{x \ln a})\, dx$, $a > 0$ and $a \neq 1$, then $I =$

(a) $\dfrac{x^{a+1}}{a+1} + \dfrac{a^x}{\ln a} + c$

(b) $\dfrac{x^{a+1}}{a+1} + \dfrac{x^a}{\ln a} + c$

(c) $\dfrac{x^{a+1}}{a+1} - \dfrac{a^x}{\ln a} + c$

(d) $\dfrac{x^{a+1}}{a+1} - \dfrac{x^a}{\ln a} + c$

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

8. $\int 8 \sin^4 x\, dx =$

(a) $3x - 2 \sin 2x + \dfrac{1}{4} \sin(4x) + c$

(b) $3x - \sin x + \dfrac{1}{4} \sin(4x) + c$

(c) $3x + \sin x + \dfrac{1}{4} \sin(4x) + c$

(d) $3x - 2 \cos 2x + \dfrac{1}{4} \sin(4x) + c$

(e) $3x - \cos x + \dfrac{1}{4} \sin(4x) + c$

9. $\int \sqrt{x} \ln \sqrt{x}\, dx =$

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

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

(c) $\frac{2}{3} x^{3/2} \ln \sqrt{x} - \frac{2}{3} \sqrt{x} + c$

(d) $\ln x - \frac{2}{9} \sqrt{x} + c$

(e) $\sqrt{x} \ln \sqrt{x} - \frac{2}{9} x^{3/2} + c$

10. The value of the integral $\int_0^{\pi/4} 6 \tan x \sec^6 x\, dx$ is

(a) 7

(b) 10

(c) $\frac{56}{5}$

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

(e) 8

11. $\int_0^{\pi/2} \sin^3 x \cos^{11} x \, dx =$

(a) $\dfrac{1}{84}$

(b) 0

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

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

(e) $\dfrac{1}{12}$

12. If $I = \displaystyle\int \frac{16}{x^3\sqrt{x^2-4}}\, dx$, $x > 2$, then $I =$

(a) $\sec^{-1}\left(\dfrac{x}{2}\right) + \dfrac{2\sqrt{x^2-4}}{x^2} + C$

(b) $\sec^{-1}(x) + \dfrac{2\sqrt{x^2-4}}{x^2} + C$

(c) $\sec^{-1}(x) - \dfrac{\sqrt{x^2-4}}{x} + C$

(d) $\sec^{-1}\left(\dfrac{x}{2}\right) - \dfrac{\sqrt{x^2-4}}{x} + C$

(e) $\sec^{-1}\left(\dfrac{x}{2}\right) + \dfrac{\sqrt{x^2-4}}{2x} + C$

13. If $-\pi < x < \pi$, then $\int \dfrac{\sqrt{3}}{4 - 2\cos x}\, dx =$

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

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

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

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

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

14. $\int_0^1 \dfrac{dx}{(x^2+1)^2} =$

(a) $\dfrac{\pi}{8} + \dfrac{1}{4}$

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

(c) $\dfrac{\pi}{2} + \dfrac{1}{3}$

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

(e) $2\,\pi$

15. $\displaystyle\int \frac{\sec\,\theta\tan\theta}{\sec\,\theta-\sec^2\,\theta}\,d\theta =$

(a) $\ln\left|\dfrac{\sec\,\theta}{1-\sec\theta}\right|+c$

(b) $\ln\,|(\sec\,\theta-1)|+c$

(c) $\ln\,|\sec^2\,\theta(\sec\,\theta-1)|+c$

(d) $\ln\,|\sec\,\theta(\sec^2\,\theta-1)|+c$

(e) $\ln\,|\sec\,\theta(\sec\,\theta-\tan\,\theta)|+c$

16. The average value of $f(x)=x\,\tan^{-1}\,x$ on $[0,1]$ is

(a) $\dfrac{\pi}{4}-\dfrac{1}{2}$

(b) $\dfrac{\pi-1}{4}$

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

(d) $\dfrac{1}{2}-\dfrac{\pi}{4}$

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

17. $\int_4^9 \frac{dx}{x(\sqrt{x}-1)} =$

(a) $\ln \frac{16}{9}$

(b) $\ln \frac{2}{3}$

(c) $\frac{4}{3}$

(d) -4

(e) 0

18. Let $I = \int_0^1 \frac{dx}{\sqrt{x}(1+x)}$, then I is

(a) convergent to $\frac{\pi}{2}$

(b) divergent

(c) convergent to $\frac{\pi}{4}$

(d) convergent to 0

(e) convergent to $\frac{\pi}{3}$

19. $\displaystyle\int_e^\infty \frac{1}{x(\ln\, x)^3}\, dx =$

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

(b) converges to $\ln\, 2$

(c) converges to $\dfrac{1}{e}$

(d) converges to $\dfrac{1}{2\ln\, 2}$

(e) diverges

20. $\displaystyle\int_0^1 (\sin^{-1}\, x)^2\, dx =$

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

(b) $\pi - 2$

(c) $\dfrac{\pi^2}{4} + 2$

(d) $\pi + 2$

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