1. $\displaystyle\int_0^1 \frac{4x}{x^2+1}\,dx =$

(a) $2 \ln 2$
(b) $4 \ln 2$
(c) $8 \ln 2$
(d) $\ln 2$
(e) $6 \ln 2$

2. $\displaystyle\int_0^1 (5x^4+6)\ \ln\left(x^5+6x+1\right)\,dx =$

(a) $8 \ln 8 - 7$
(b) $4 \ln 4 - 4$
(c) $3 \ln 3 - 2$
(d) $8 \ln 8 - 8$
(e) $4 \ln 4 - 3$

3. The area of the region in the first quadrant that is enclosed by the curves $x - y = 2$ and $x = y^2$, is equal to

(a) $\frac{10}{3}$

(b) $\frac{26}{3}$

(c) $\frac{27}{2}$

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

(e) $\frac{10}{9}$

4. $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} 9\csc^4 x \, dx =$

(a) 12

(b) 8

(c) 6

(d) 10

(e) 14

5. $\int_0^1 \frac{dx}{x^2 - x - 2} =$

(a) $-\frac{2}{3}\ln 2$

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

(c) $-\frac{1}{3}\ln 2$

(d) $\frac{1}{3}\ln 2$

(e) $\frac{4}{3}\ln 2$

6. The improper integral $\int_{-1}^4 \frac{dx}{3\sqrt{|x|}}$

(a) converges to 2

(b) converges to 3

(c) converges to 1

(d) converges to 0

(e) diverges

7. The volume of the solid, generated by rotating the region enclosed by the triangle with vertices $(1, 0)$, $(2, 1)$ and $(1, 1)$ about the x-axis, is

(a) $\frac{2\pi}{3}$

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

(c) $\frac{7\pi}{15}$

(d) $\frac{4\pi}{15}$

(e) $\frac{4\pi}{3}$

8. The area of the surface generated by rotating the curve $y = \sqrt{2x - x^2}$, $\frac{1}{2} \leq x \leq 1$, about the x-axis is

(a) π

(b) π^2

(c) $\frac{4\pi}{5}$

(d) $3\,\pi$

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

9. The average value of the function $f(x) = \dfrac{4\sin x}{1+\cos^2 x}$ over the interval $[0, \pi]$ is

(a) 2

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

(c) 4

(d) 1

(e) $\dfrac{1}{8}$

10. $\displaystyle\int \sin x \ \sinh x \ dx =$

(a) $\dfrac{1}{2}\sin x\cosh x - \dfrac{1}{2}\cos x\sinh x + C$

(b) $\dfrac{1}{2}\cos x\cosh x - \dfrac{1}{2}\sin x\sinh x + C$

(c) $\dfrac{1}{4}\sin x\cosh x - \dfrac{1}{4}\cos x\sinh x + C$

(d) $\dfrac{1}{4}\cos x\cosh x - \dfrac{1}{4}\sin x\sinh x + C$

(e) $\dfrac{1}{3}\sin x\cos x - \dfrac{1}{3}\cos x\sinh x + C$

11. The sequence $\left\{n \sin\left(\pi + \frac{3}{n}\right)\right\}_{n=1}^{\infty}$

(a) converges to -3

(b) converges to -2

(c) diverges

(d) converges to -3π

(e) converges to -2π

12. The series $\sum_{n=0}^{\infty}\left[6\tan^{-1}\left(\frac{\sqrt{3}}{n+1}\right) - 6\tan^{-1}\left(\frac{\sqrt{3}}{n+2}\right)\right]$

(a) converges to 2π

(b) converges to π

(c) converges to 3π

(d) converges to $\frac{\pi}{2}$

(e) diverges

13. The series $\sum_{n=2}^{\infty} \frac{\cos\left(\frac{\pi}{n}\right)}{n^2+1}$ is

(a) convergent by the Comparison Test

(b) divergent by the Comparison Test

(c) convergent by the Ratio Test

(d) divergent by the Ratio Test

(e) divergent by the Test of Divergence

14. $\sum_{n=1}^{\infty} \left[(-0.2)^n + (0.6)^{n-1}\right] =$

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

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

(c) $\frac{8}{3}$

(d) $\frac{11}{3}$

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

15. Using the Alternating Series Estimation Theorem, the minimum value of n for which nth partial sums s_n approximates the sum of $\sum_{n=0}^{\infty} \frac{(-1)^n}{\sqrt[3]{n+4}}$ with $|\text{error}| < 0.1$ is

(a) 996
(b) 998
(c) 994
(d) 1000
(e) 999

16. The interval of convergence of the power series

$$\sum_{n=0}^{\infty} \frac{(x+3)^n}{n\,5^n}$$

is

(a) $[-8, 2)$
(b) $[-8, 2]$
(c) $[-7, 1)$
(d) $[-7, 1]$
(e) $[-8, 7)$

17. The series $\sum_{n=1}^{\infty}(-1)^n \frac{n^{100}\,100^n}{n!}$

(a) converges absolutely

(b) converges conditionally

(c) diverges

(d) converges by the Integral Test

(e) diverges by the Limit Comparison Test

18. The series $\sum_{n=2}^{\infty}(-1)^n \frac{1}{n\ln n}$

(a) converges conditionally

(b) converges absolutely

(c) converges by the Integral Test

(d) diverges by the Test of Divergence

(e) converges as a p – series

19. The Taylor series of the function $f(x) = e^{2x}$ centered at $a = 3$ is

(a) $\sum_{n=0}^{\infty} \frac{2^n e^6}{n!}(x-3)^n$

(b) $\sum_{n=0}^{\infty} \frac{2^n}{n!}(x-3)^n$

(c) $\sum_{n=0}^{\infty} \frac{e^6}{2^n n!}(x-3)^n$

(d) $\sum_{n=0}^{\infty} \frac{2^n}{n!}(x+3)^n$

(e) $\sum_{n=0}^{\infty} \frac{2^n e^6}{n}(x+3)^n$

20. $\int_0^{\frac{1}{2}} \frac{\tan^{-1} x}{x}\, dx =$

(a) $\sum_{n=0}^{\infty} \frac{(-1)^n}{2^{2n+1}(2n+1)^2}$

(b) $\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)^2}$

(c) $\sum_{n=0}^{\infty} \frac{(-1)^n}{2^{2n+1}(2n+1)}$

(d) $\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+2)(2n+1)^2}$

(e) $\sum_{n=0}^{\infty} \frac{(-1)^n 2^{2n+1}}{(2n+1)^2}$

21. For $x \in (0, 2)$, if

$$-\frac{1}{x^2} = \sum_{n=0}^{\infty} c_n (1-x)^n,$$

then $c_{19} + c_{20} =$

(a) -41

(b) 1

(c) -39

(d) -21

(e) -40

1. $\int_0^1 \frac{8x}{x^2+1}\, dx =$

(a) $4 \ln 2$
(b) $2 \ln 2$
(c) $8 \ln 2$
(d) $\ln 2$
(e) $6 \ln 2$

2. $\int_0^1 (5x^4+2)\ \ln\left(x^5+2x+1\right)\, dx =$

(a) $4 \ln 4 - 3$
(b) $4 \ln 4 - 4$
(c) $3 \ln 3 - 2$
(d) $8 \ln 8 - 8$
(e) $8 \ln 8 - 7$

3. The area of the region in the first quadrant that is enclosed by the curves $x - y = 6$ and $x = y^2$, is equal to

(a) $\frac{27}{2}$

(b) $\frac{26}{3}$

(c) $\frac{10}{3}$

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

(e) $\frac{10}{9}$

4. $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} 6\csc^4 x\, dx =$

(a) 8

(b) 12

(c) 6

(d) 10

(e) 14

5. $\displaystyle\int_0^{-1} \frac{dx}{x^2+x-2} =$

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

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

(c) $-\frac{1}{3}\ln 2$

(d) $\frac{1}{3}\ln 2$

(e) $\frac{4}{3}\ln 2$

6. The improper integral $\displaystyle\int_{-1}^{4} \frac{dx}{2\sqrt{|x|}}$

(a) converges to 3

(b) converges to 2

(c) converges to 1

(d) converges to 0

(e) diverges

7. The volume of the solid, generated by rotating the region enclosed by the triangle with vertices $(1,0)$, $(2,1)$ and $(1,1)$ about the x-axis, is

(a) $\frac{2\pi}{3}$

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

(c) $\frac{7\pi}{15}$

(d) $\frac{4\pi}{15}$

(e) $\frac{4\pi}{3}$

8. The area of the surface generated by rotating the curve $y = \sqrt{2x - x^2}$, $\frac{1}{2} \leq x \leq 1$, about the x-axis is

(a) π

(b) π^2

(c) $\frac{4\pi}{5}$

(d) 3π

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

9. The average value of the function $f(x) = \dfrac{8\sin x}{1+\cos^2 x}$ over the interval $[0,\pi]$ is

(a) 4

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

(c) 2

(d) 1

(e) $\dfrac{1}{8}$

10. $\int \sin x \ \sinh x \ dx =$

(a) $\dfrac{1}{2}\sin x\cosh x - \dfrac{1}{2}\cos x\sinh x + C$

(b) $\dfrac{1}{2}\cos x\cosh x - \dfrac{1}{2}\sin x\sinh x + C$

(c) $\dfrac{1}{4}\sin x\cosh x - \dfrac{1}{4}\cos x\sinh x + C$

(d) $\dfrac{1}{4}\cos x\cosh x - \dfrac{1}{4}\sin x\sinh x + C$

(e) $\dfrac{1}{3}\sin x\cos x - \dfrac{1}{3}\cos x\sinh x + C$

11. The sequence $\left\{n \sin\left(\pi + \frac{2}{n}\right)\right\}_{n=1}^{\infty}$

(a) converges to -2

(b) converges to -3

(c) diverges

(d) converges to -3π

(e) converges to -2π

12. The series $\sum_{n=0}^{\infty} \left[9\tan^{-1}\left(\frac{\sqrt{3}}{n+1}\right) - 9\tan^{-1}\left(\frac{\sqrt{3}}{n+2}\right)\right]$

(a) converges to 3π

(b) converges to π

(c) converges to 2π

(d) converges to $\frac{\pi}{2}$

(e) diverges

13. The series $\sum_{n=2}^{\infty} \frac{\cos\left(\frac{\pi}{n}\right)}{n^2+1}$ is

(a) convergent by the Comparison Test

(b) divergent by the Comparison Test

(c) convergent by the Ratio Test

(d) divergent by the Ratio Test

(e) divergent by the Test of Divergence

14. $\sum_{n=1}^{\infty} \left[(-0.2)^n + (0.4)^{n-1}\right] =$

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

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

(c) $\frac{8}{3}$

(d) $\frac{11}{3}$

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

15. Using the Alternating Series Estimation Theorem, the minimum value of n for which nth partial sums s_n approximates the sum of $\sum_{n=0}^{\infty} \frac{(-1)^n}{\sqrt[3]{n+2}}$ with $|\text{error}| < 0.1$ is

(a) 998
(b) 1000
(c) 996
(d) 994
(e) 999

16. The interval of convergence of the power series

$$\sum_{n=0}^{\infty} \frac{(x+3)^n}{n\,4^n}$$

is

(a) $[-7, 1)$
(b) $[-8, 2]$
(c) $[-8, 2)$
(d) $[-7, 1]$
(e) $[-8, 7)$

17. The series $\sum_{n=1}^{\infty} (-1)^n \frac{n^{100}\,100^n}{n!}$

(a) converges absolutely

(b) converges conditionally

(c) diverges

(d) converges by the Integral Test

(e) diverges by the Limit Comparison Test

18. The series $\sum_{n=2}^{\infty} (-1)^n \frac{1}{n \ln n}$

(a) converges conditionally

(b) converges absolutely

(c) converges by the Integral Test

(d) diverges by the Test of Divergence

(e) converges as a p-series

19. The Taylor series of the function $f(x) = e^{3x}$ centered at $a = 2$ is

(a) $\sum_{n=0}^{\infty} \frac{3^n e^6}{n!}(x-2)^n$

(b) $\sum_{n=0}^{\infty} \frac{3^n}{n!}(x-2)^n$

(c) $\sum_{n=0}^{\infty} \frac{e^6}{3^n n!}(x-2)^n$

(d) $\sum_{n=0}^{\infty} \frac{3^n}{n!}(x+2)^n$

(e) $\sum_{n=0}^{\infty} \frac{3^n e^6}{n}(x+2)^n$

20. $\int_0^{\frac{1}{3}} \frac{\tan^{-1} x}{x}\, dx =$

(a) $\sum_{n=0}^{\infty} \frac{(-1)^n}{3^{2n+1}(2n+1)^2}$

(b) $\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)^2}$

(c) $\sum_{n=0}^{\infty} \frac{(-1)^n}{3^{2n+1}(2n+1)}$

(d) $\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+2)(2n+1)^2}$

(e) $\sum_{n=0}^{\infty} \frac{(-1)^n 3^{2n+1}}{(2n+1)^2}$

21. For $x \in (0,2)$, if

$$-\frac{1}{x^2} = \sum_{n=0}^{\infty} c_n (1-x)^n,$$

then $c_{18} + c_{19} =$

(a) -39

(b) 1

(c) -41

(d) -21

(e) -40