1. $\int (\tan^2 x - \csc^2 x)\, dx =$

(a) $-x + \tan x + \cot x + C$

(b) $x^2 + \tan x + \cot x + C$

(c) $x + \tan^2 x + \cot^2 x + C$

(d) $x^2 - \tan x - \cot x + C$

(e) $x^2 + \tan x - \cot x + C$

2. $\int_{-1}^{0} 5x^4 (1 + x^5)^9\, dx =$

(a) 0.1

(b) 0.2

(c) 0.45

(d) 0.6

(e) 0.9

3. If $g(x) = \int_1^{x^2} \ln t \, dt + \int_{x^2}^{2} \ln(t+1) \, dt$, then $g'(2) =$

(a) $4 \ln\left(\frac{4}{5}\right)$

(b) $4 \ln\left(\frac{3}{5}\right)$

(c) $4 \ln\left(\frac{7}{5}\right)$

(d) $4 \ln\left(\frac{6}{5}\right)$

(e) $4 \ln\left(\frac{9}{5}\right)$

4. If $f'(x) = \sqrt{4e^{2x} - 1}$, then the length of the curve $y = f(x)$, $0 \le x \le 1$, is equal to

(a) $2e - 2$

(b) $2e - 4$

(c) $4e - 2$

(d) $2e - 1$

(e) $e - 2$

5. Using two rectangles and taking the sample points to be midpoints, the estimate of the area under the graph of $f(x) = e^{x^2}$ from $x = 0$ to $x = 4$ is equal to

(a) $2\left(e + e^9\right)$

(b) $3\left(e + e^9\right)$

(c) $3\left(2e + e^9\right)$

(d) $2\left(e^2 + e^9\right)$

(e) $3\left(e^2 + e^9\right)$

6. Using partial fractions, $\int_0^1 \frac{x^2-3}{x^2-4}\,dx =$

(a) $1 - \frac{1}{4}\ln 3$

(b) $1 + \frac{1}{2}\ln 3$

(c) $2 + \frac{1}{4}\ln 3$

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

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

7. $\int (x+1) \sec x \, \tan x \, dx =$

(a) $(x+1)\, \sec\, x - \ln|\sec\, x + \tan\, x| + C$

(b) $(x+1)\, \tan\, x - \ln|\sec\, x + \tan\, x| + C$

(c) $(x+1)\, \tan\, x + \ln|\sec\, x + \tan\, x| + C$

(d) $(x+1)\, \sec\, x + \ln|\sec\, x - \tan\, x| + C$

(e) $(x+1)\, \sec\, x \tan\, x + \ln|\sec\, x + \tan\, x| + C$

8. $\int_0^{\pi/8} 4\, \sin^2 x\, \cos^2 x\, dx =$

(Hint: Use the double angle identify $\sin(2x) = 2\, \sin x \cos x$ first)

(a) $\dfrac{\pi - 2}{16}$

(b) $\dfrac{\pi - 2}{14}$

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

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

(e) $\dfrac{\pi - 2}{12}$

9. $\int_0^{\pi/2} \cos(4x)\ \cos(5x)\, dx =$

(a) $\frac{5}{9}$

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

(c) $\frac{9}{20}$

(d) $\frac{7}{9}$

(e) $\frac{9}{7}$

10. $\int_{-\infty}^{0} 10^x\, dx =$

(a) $\frac{1}{\ln 10}$

(b) $\frac{10}{\ln 10}$

(c) 0

(d) $\frac{5}{\ln 10}$

(e) $\frac{25}{\ln 10}$

11. The area under the curve

$$y = \sqrt{\pi^2 - x^2} \text{ from } x = 0 \text{ to } x = \frac{\pi}{2}$$

is equal to

(a) $\frac{\pi^3}{12} + \frac{\sqrt{3}\pi^2}{8}$

(b) $\frac{\pi^3}{6} + \frac{\sqrt{3}\pi^2}{8}$

(c) $\frac{\pi^3}{3} + \frac{\sqrt{3}\pi^2}{6}$

(d) $\frac{\pi^3}{12} - \frac{\sqrt{3}\pi^2}{4}$

(e) $\frac{\pi^3}{6} - \frac{\sqrt{3}\pi^2}{8}$

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

(a) $\frac{\pi}{4} + \frac{1}{2} \ln 2$

(b) $\frac{\pi}{2} + \frac{1}{4} \ln 2$

(c) $\frac{\pi}{4} + \frac{1}{4} \ln 2$

(d) $\frac{\pi}{2} - \frac{1}{2} \ln 2$

(e) $\frac{\pi}{2} + \frac{1}{2} \ln 2$

13. The area enclosed by the curves $y = x^2$ and $y = 4\,|x|$ is equal to

(a) $\dfrac{64}{3}$

(b) $\dfrac{56}{3}$

(c) $\dfrac{34}{3}$

(d) $\dfrac{26}{3}$

(e) $\dfrac{28}{3}$

14. Let R be the region bounded by the lines $y = x + 1$, $y = 2$ and $x = 0$. The volume of the solid obtained by rotating R about the line $y = -1$ is equal to

(a) $\dfrac{8\,\pi}{3}$

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

(c) $\dfrac{5\,\pi}{3}$

(d) $\dfrac{7\,\pi}{3}$

(e) $\dfrac{10\,\pi}{3}$

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

(a) converges to 0

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

(c) converges to 1

(d) converges to $-\frac{1}{2}$

(e) diverges

16. The geometric series

$$\sum_{n=0}^{\infty}(\pi-4)^n$$

(a) converges to $\frac{1}{5-\pi}$

(b) converges to $\frac{1}{\pi-3}$

(c) diverges to $+\infty$

(d) diverges to $-\infty$

(e) converges to $\frac{1}{3-\pi}$

17. For positive real numbers a and b, the series $\sum_{n=1}^{\infty}\left(\frac{an^2+bn+1}{bn^2+an+1}\right)^n$ converges if

(a) $a < b$

(b) $a > b$

(c) $a = b$

(d) $ab > 1$

(e) $ab < 1$

18. $\sum_{n=0}^{\infty}\frac{(-1)^n\left(\frac{\pi}{2}\right)^{2n}}{(2n)!} =$

(a) 0

(b) 1

(c) -1

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

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

19. The series

$$\sum_{n=1}^{\infty} \frac{(2n)!}{(3)(5)(7)\ldots(2n+1)}$$

is

(a) divergent by the Ratio Test

(b) convergent by the Ratio Test

(c) a series for which the Ratio Test is inconclusive

(d) conditionally convergent

(e) absolutely convergent

20. Which of the following statements is **True**?

(a) $\sum_{n=1}^{\infty} \frac{(-1)^n}{n!}$ is absolutely convergent

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

(c) $\sum_{n=1}^{\infty} \frac{(n-1)!}{n!}$ is convergent

(d) $\sum_{n=1}^{\infty} (-1)^n$ is conditionally convergent

(e) $\sum_{n=1}^{\infty} \frac{(-1)^n}{n}$ is divergent

21. The series $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n+1}}$

(a) converges conditionally

(b) converges absolutely

(c) diverges

(d) converges as a geometric series

(e) converges as a $p-$ series with $p = \frac{1}{2}$

22. Which of the following series is convergent?

I. $\sum_{n=1}^{\infty} \left(\frac{\sin n}{n}\right)^2$

II. $\sum_{n=1}^{\infty} \frac{\tan^{-1} n}{n}$

III. $\sum_{n=1}^{\infty} \frac{\sqrt{n}}{2n^2 - n}$

(a) I and III only

(b) I and II only

(c) II and III only

(d) all of I, II, and III

(e) none of I, II, or III

23. The interval of convergence of the series

$$\sum_{n=1}^{\infty} \frac{1}{n}\left(\frac{x}{e}\right)^n$$

is

(a) $I = [-e, e)$

(b) $I = (-e, e]$

(c) $I = [0, e]$

(d) $I = (0, e]$

(e) $I = [-e, 0) \cup (0, e]$

24. Using the Integral Test Remainder Estimate for the series $\sum_{n=1}^{\infty} \frac{1}{n^4}$, we find that the smallest number of terms needed to ensure that the sum is accurate to within 0.009 is equal to

(a) 4

(b) 5

(c) 6

(d) 7

(e) 2

25. The Maclaurin series for $f(x) = \sin(3x)$ is

(a) $3\sum_{n=0}^{\infty}(-9)^n \frac{x^{2n+1}}{(2n+1)!}$

(b) $3\sum_{n=0}^{\infty}(-9)^n \frac{x^{2n}}{(2n)!}$

(c) $\sum_{n=0}^{\infty}(-27)^n \frac{x^{2n+1}}{(2n+1)!}$

(d) $\sum_{n=0}^{\infty}(-27)^n \frac{x^{2n}}{(2n)!}$

(e) $\sum_{n=0}^{\infty}(-27)^n \frac{x^{2n-1}}{(2n-1)!}$

26. The Taylor series for $f(x) = \frac{1}{x}$ centered at $a = 1$ is

(a) $\sum_{n=0}^{\infty}(1-x)^n$

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

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

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

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

27. $\int_0^2 e^{-t^3}\,dt =$

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

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

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

(d) $\sum_{n=0}^{\infty} \frac{1}{n!} \frac{8^n}{2n+1}$

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

28. The series $\sum_{n=2}^{\infty} \frac{3}{(n+1)^p (n-1)^q}$ converges if

(a) $p + q > 1$

(b) $p + q < -1$

(c) $p + q = 1$

(d) $p + q = \frac{1}{2}$

(e) $-1 < p + q < 1$

Answer KEY

Q	MM	V1	V2	V3	V4
1	a	b	b	d	c
2	a	b	e	c	d
3	a	d	b	c	c
4	a	b	a	d	e
5	a	a	d	a	e
6	a	c	d	c	b
7	a	d	a	a	e
8	a	a	a	e	b
9	a	e	c	d	d
10	a	a	c	b	e
11	a	d	a	b	c
12	a	c	b	e	b
13	a	b	b	b	c
14	a	a	d	e	a
15	a	a	e	c	c
16	a	d	c	e	b
17	a	c	a	c	c
18	a	c	a	e	e
19	a	a	b	b	a
20	a	a	a	a	c
21	a	c	b	a	d
22	a	d	d	d	b
23	a	d	b	a	c
24	a	e	d	b	d
25	a	a	a	d	c
26	a	a	d	b	e
27	a	b	a	c	e
28	a	a	a	d	a