1. We want to approximate the sum

$$\sum_{k=1}^{\infty} \frac{(-1)^k}{k^2+1}.$$

The alternating series error estimate guarantees that the error is $< 10^{-4}$, provided we add the first n terms, where $n =$

A. 9

B. 10

C. 49

D. 99

E. None of the above is correct.

2. $\int_1^2 x \ln x \, dx =$

A. $\ln 2 - 1$

B. $\ln \sqrt{2} - 1/2$

C. $2 \ln 2 - 3/2$

D. $\ln 2 - 3/2$

E. $2 \ln 2 - 3/4$

3. The length of the curve $x = e^t \cos 2t,\ y = e^t \sin 2t,\ 0 \leq t \leq 1$, is

   A. 1

   B. 3

   C. $\sqrt{5}\,(e-1)$

   D. $\sqrt{2}\,e$

   E. $6e-2$

4. $\dfrac{2+i}{3-i} =$

   A. $2i$

   B. $2-i$

   C. $1+2i$

   D. $1-2i$

   E. None of the above.

5. The vector of length 6 that points in the opposite direction to $2\vec{i} - \vec{j} + 2\vec{k}$ is

   A. $-6\vec{i} + 3\vec{j} - 6\vec{k}$

   B. $\vec{i} - \dfrac{\vec{j}}{2} + \vec{k}$

   C. $-4\vec{i} + 2\vec{j} - 4\vec{k}$

   D. $-2\sqrt{3}\,\vec{i} + \sqrt{3}\,\vec{j} - 2\sqrt{3}\,\vec{k}$

   E. $-2\sqrt{6}\,\vec{i} + \sqrt{6}\,\vec{j} - 2\sqrt{6}\,\vec{k}$.

6. The Maclaurin series of $\sqrt{1+4x^2}$ is

   A. $1 + 2x^2 - 2x^4 + 4x^6 + \ldots$

   B. $1 + 2x^2 - 3x^4 + 6x^6 + \ldots$

   C. $1 + 2x^2 - 2x^4 + 8x^6 + \ldots$

   D. $1 + 2x^2 - 3x^4 - 5x^6 + \ldots$

   E. $1 + 2x^2 - 2x^4 - 5x^6 + \ldots$

7. $\int_1^\infty xe^{-x^2}\,dx =$

A. $1/e^2$

B. $1/(2e)$

C. $1/e$

D. $2/3$

E. The integral diverges.

8. Evaluate $5 - \frac{25}{6} + \frac{125}{36} - \frac{625}{216} + \ldots$

A. 30/11

B. 6/11

C. 30/7

D. 15/11

E. 15/7

9. Determine whether the following sequence and series converge:

$$\left\{\frac{2n^2-1}{3n^2+8n}\right\}_{n=1}^{\infty}, \qquad \sum_{n=1}^{\infty}\frac{2n^2-1}{3n^2+8n}.$$

A. Both converge.

B. Only the sequence converges.

C. Only the series converges.

D. Neither converge.

E. None of the above is correct.

10. Consider the series

I. $1-1+1-1+1-\ldots$,

II. $\frac{\ln 3}{3}-\frac{\ln 6}{6}+\frac{\ln 9}{9}-\frac{\ln 12}{12}+\ldots$

A. By the alternating series test both are convergent.

B. By the alternating series test both are divergent.

C. The alternating series test is inconclusive for both.

D. II. is convergent by the alternating series test, I. is divergent.

E. I. is conditionally, II. is absolutely convergent.

11. If $\sum_{n=1}^{\infty} \frac{(x-1)^{3n}}{2+n+n^2}$ is the Taylor series of a function $g(x)$, then $g^{(6)}(1) =$

A. 90

B. 36

C. -36

D. -32

E. 24

12. The area between the curves $y = 1 - 2x$ and $2 - 2x - x^2$ is

A. 7/3

B. 4/3

C. 5/6

D. 2

E. 3/2

13. Which statement(s) is true?

I. The series $\sum_{k=2}^{\infty} \frac{1}{k \ln^q k}$ converges for $q = 1$.

II. The series $\sum_{k=2}^{\infty} \frac{1}{k \ln^q k}$ converges for $q = 2$.

A. Only I;

B. Only II;

C. Both are true

D. Neither is true

E. None of the above is correct.

14. $\sum_{k=1}^{\infty} \frac{2^{k+4}}{k^2 2^k + k^3}$ is

A. convergent by the ratio test;

B. divergent by the ratio test;

C. convergent by the comparison test;

D. divergent by the comparison test;

E. convergent by the root test.

15. Which is/are absolutely convergent?

I. $\displaystyle\sum_{i=1}^{\infty} \frac{(-1)^i}{i}$

II. $\displaystyle\sum_{j=1}^{\infty} \frac{(-1)^j}{j^2}$

III. $\displaystyle\sum_{k=1}^{\infty} \frac{(-1)^k e^k}{k^k}$

A. All are.

B. None is.

C. Only I and II.

D. Only II and III.

E. Only II.

16. $\displaystyle\int \frac{2dx}{x^2(x-1)} =$

A. $\displaystyle\ln\left|\frac{x}{x-2}\right| - \frac{2}{x} + C$

B. $\displaystyle\ln\left|\frac{x-1}{x}\right| + \frac{1}{x} + C$

C. $\displaystyle 2\ln\left|\frac{x-1}{x}\right| + \frac{2}{x} + C$

D. $\displaystyle 2\ln\left|\frac{x}{x-1}\right| + \frac{1}{x} + C$

E. $\displaystyle\ln\left|\frac{x-1}{x}\right| - \frac{2}{x} + C$

17. Which integral arises when one uses a trigonometric substitution to compute

$$\int \frac{x^2 dx}{\sqrt{4+x^2}}?$$

A. $\int 4\tan^2\theta \sec\theta d\theta$

B. $\int 2\tan^2\theta \cos\theta d\theta$

C. $\int 8\tan^2\theta \sec^2\theta d\theta$

D. $\int 4\tan^2\theta \cos\theta d\theta$

E. $\int 4\sec^3\theta d\theta$

18. The radius of convergence of the series

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

is

A. $\sqrt{2}$

B. $\sqrt{3}$

C. 3

D. 1

E. ∞

19. The tangent line to the curve $x = \cos t + \sin t$, $y = e^{2t}$, corresponding to $t = 0$, has equation

A. $y = x$

B. $y = ex + 1 - e$

C. $y = x \ln 2 + 1 - \ln 2$

D. $y = \dfrac{3 - x}{2}$

E. $y = 2x - 1$

20. The polar coordinates of a point are $r = 2\sqrt{3}$, $\theta = \pi/3$. What are its Cartesian coordinates?

A. $(3, \sqrt{2})$

B. $(1, 3)$

C. $(\sqrt{3}, 3)$

D. $(2\sqrt{3}, \sqrt{3}/2)$

E. None of the above.

21. $\lim_{n\to\infty} (n+2)^{1/3n} =$

A. 1/6

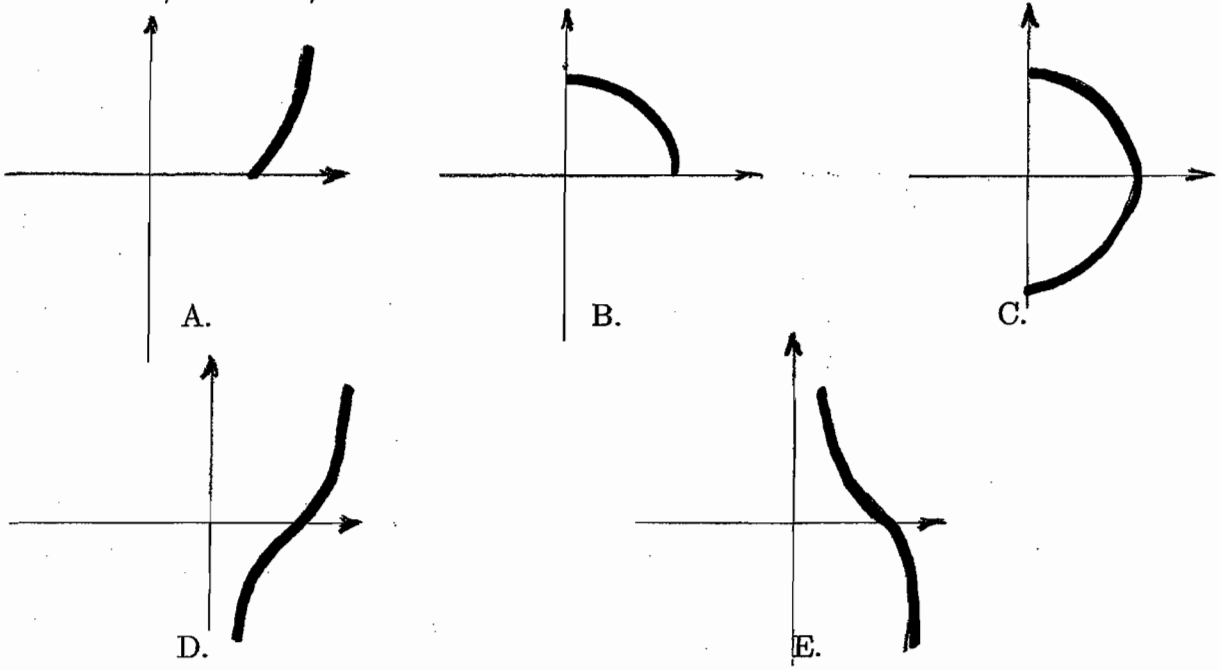
B. 1/3

C. 1

D. 0

E. The limit does not exist.

22. Which curve is represented by the parametric equations $x = \sec t$, $y = \tan^2 t$, $-\pi/2 < t < \pi/2$?



23. The cosine of the angle between the vectors $2\vec{i} - \vec{j} + \vec{k}$ and $\vec{i} + \vec{k}$ is

A. $1/\sqrt{2}$

B. $\sqrt{3}/2$

C. $1/\sqrt{12}$

D. $3/\sqrt{6}$

E. $1/2$

24. Let D be the region in the xy plane bounded by $y = 2x - x^2$ and the x–axis. Find the volume of the solid obtained by revolving D about the y axis.

A. $11\pi/6$

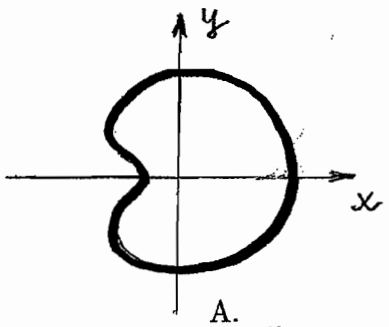
B. 2π

C. $8\pi/3$

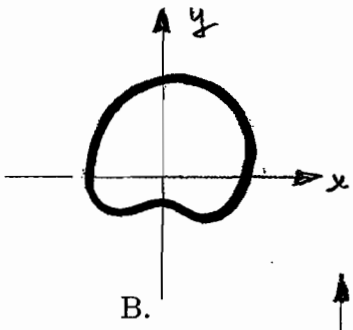
D. $13\pi/4$

E. 3π

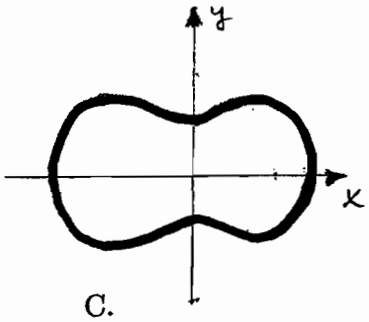
25. Which of the curves below corresponds to the polar equation $r = 2 + \cos 2\theta$?



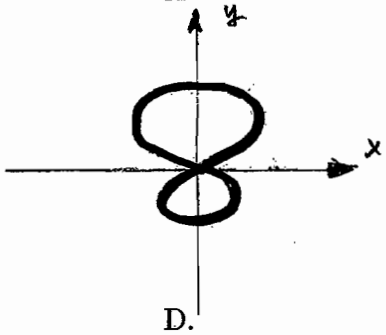
A.



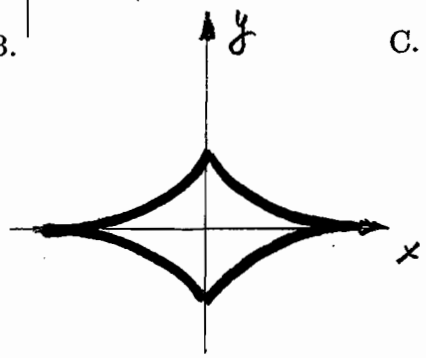
B.



C.



D.



E.