MAC2312 Final

1. The integral $\int_0^{\pi/4} t\sin 2t\ dt$ is equal to:

A. $-1/4$ B. 0 C. $\sqrt{2}/4$ D. $1/2$ E. $1/4$

2. The volume obtained by revolving the part of the curve $y = x^{1/3},\ x \in [1, 27]$, about the x-axis is:

A. $726\pi/5$ B. $343\pi/5$ C. $147\pi/5$ D. $292\pi/5$ E. $697\pi/5$

3. The Taylor series centered at 1 for $f(x) = 1/x$ is given by :

A. $\sum_{n=0}^{\infty} (-1)^n x^n$ B. $\sum_{n=0}^{\infty} \frac{(-1)^n (x+1)^n}{n!}$ C. $\sum_{n=0}^{\infty} \frac{(-1)^n (x-1)^n}{n}$ D. $\sum_{n=0}^{\infty} \frac{(-1)^{n+1} (x+1)^n}{n!}$

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

4. The integral $\int_{-\infty}^{0} xe^x\ dx$:

A. diverges B. is equal to -1 C. is equal to -1/2 D. is equal to -3/2 E. is equal to -2

5. The length of the curve $y = x^2 - (\ln x)/8,\ x \in [1, 2]$ is :

A. $2-(1/8)\ln 4$ B. $5-(1/8)\ln 4$ C. $3+(1/8)\ln 2$ D. $4+(1/8)\ln 2$ E. $5+(1/8)\ln 4$

6. (Circle the best response) The series $\sum_{n=0}^{\infty} \frac{n^2+1}{n^3+1}$:

A. converges by the root test B. converges by ratio test C. diverges by ratio test

D. diverges by limit comparison test E. none of the above

7. The integral for the area of the surface generated by revolving the curve $y = e^{2x}$, $1 \le x \le 3$, about the y-axis is given by:

A. $\int_0^{e^6} 2\pi \ln y \sqrt{1 + 1/y^2}\, dy$ B. $\int_e^{6e} 2\pi \ln y \sqrt{1 + 1/y^2}\, dy$ C. $\int_{e^2}^{e^6} 2\pi \ln y \sqrt{1 + (\ln y)^2}\, dy$

D. $\int_1^3 2\pi x \sqrt{1 + 4e^{2x}}\, dx$ E. $\int_1^3 2\pi x \sqrt{1 + 4e^{4x}}\, dx$

8. The integral $\int \tan^6 x \sec^4 x\, dx$ is equal to:

A. $(\tan^7 x)/7 + (\tan^9 x)/9 + C$ B. $(\sec^7 x)/7 + (\sec^9 x)/9 + C$ C. $(\tan^7 x)/7 + (\sec^9 x)/9 + C$

D. $(\tan^6 x)/6 + (\tan^8 x)/8 + C$ E. $(\tan^7 x)/7 - (\tan^8 x)/8 + C$

9. The area enclosed by the curves $y = x^3$ and $y = 4x$ is equal to:

A. 0 B. 2 C. 4 D. 6 E. 8

10. The interval of convergence of the series $\sum_{n=0}^{\infty} \frac{(-3)^n x^n}{\sqrt{n+1}}$ is given by:

A. $\left(\frac{-1}{9}, \frac{1}{9}\right)$ B. $\left[\frac{-1}{9}, \frac{1}{9}\right)$ C. $\left(\frac{-1}{3}, \frac{1}{3}\right)$ D. $\left(\frac{-1}{3}, \frac{1}{3}\right]$ E. $\left[\frac{-1}{3}, \frac{1}{3}\right)$

BONUS. The best method to determine the convergence or divergence of the series $\sum_{n=1}^{\infty} k^2 e^{-k}$ is the:

A. integral test   B. alternating series test   C. comparison test   D. test for divergence

E. ratio test

Solutions:

1. E   2. A   3. E   4. B   5. C   6. D   7. E   8. A   9. E   10. D   BONUS. E