1. The partial fraction decomposition of the rational function $\dfrac{x^2+1}{x^3(x^2+x+3)^2}$ is

   A) $\dfrac{A}{x^3}+\dfrac{Bx+C}{(x^2+x+3)^2}$

   B) $\dfrac{A}{x^2}+\dfrac{B}{x^3}+\dfrac{Cx+D}{(x^2+x+3)}+\dfrac{Ex+F}{(x^2+x+3)^2}$

   C) $\dfrac{A}{x}+\dfrac{B}{x^2}+\dfrac{Cx+D}{x^2+x+3}$

   D) $\dfrac{A}{x^3}+\dfrac{Bx+C}{x^2+x+3}+\dfrac{Dx+E}{(x^2+x+3)^2}$

   E) None of the above.

2. Compute $\displaystyle\int \frac{2x^2dx}{x^2+2x+2}$.

   A) $2x+4\ln|x+1|+C$

   B) $4x+2\ln|x^2+2x|+C$

   C) $2x-2\ln|x^2+2x+2|+C$

   D) $2x^2-4\ln|x^2+2x+2|+C$

   E) $2x^2-8\ln|x^2+2x+2|+C$

3. Compute $\int_0^2 (\ln x + x)dx$

A) $\ln 2 - \frac{1}{2}$

B) $2\ln 2 + \frac{1}{2}$

C) $2\ln 2 - 2$

D) $2\ln 2 + 2$

E) $2\ln 2$

4. The length of the curve $y = x^{3/2}$, $0 \leq x \leq 1$, is

A) $\sqrt{13} - 2$

B) $\dfrac{1}{27}(13^{3/2} - 8)$

C) $\dfrac{1}{\sqrt{27}}(5^{3/2} - 1)$

D) $\dfrac{1}{27}(13^{3/2} + 8)$

E) $\dfrac{1}{8}(5^{3/2} - 1)$

5. The trapezoidal rule applied to the function x^2+1 with $n=4$ gives $\int_0^2 (x^2+1)dx \approx T_4 =$

   A) $\frac{13}{2}$

   B) $\frac{13}{4}$

   C) 6

   D) $\frac{19}{4}$

   E) None of the above.

6. Let C be the curve $y = \sqrt{1+4x}$ for $1 \leq x \leq 5$. If S is the surface obtained by rotating C about the x–axis, then the surface area of S is

A) $\dfrac{2\pi}{3}\ (5^{3/2} - 2^{3/2})$

B) $\dfrac{\pi}{3}(2^{3/2} - 1)$

C) $2\pi(5^{3/2} - 2^{3/2})$

D) $\dfrac{\pi}{3}(25^{3/2} - 9^{3/2})$

E) $\dfrac{\pi}{6}(25^{3/2} - 9^{3/2})$

7. Let D be the region in the first quadrant bounded by $y = \sqrt{x}$ and $y = x^3$. If $(\overline{x}, \overline{y})$ is the centroid of D, and if A is the area of D, then $\overline{x}$ equals

A) $\dfrac{2}{7A}$

B) $\dfrac{3}{35A}$

C) $\dfrac{2}{15A}$

D) $\dfrac{3}{14A}$

E) $\dfrac{1}{5A}$

8. Let D be the region bounded by $x = 0,\ x = 1,\ y = x$ and $y = \sqrt{1 + x^2}$. If A is the area of D and $(\overline{x}, \overline{y})$ is the centroid of D, then $\overline{y}$ equals

A) $\dfrac{1}{2A}$

B) $\dfrac{\sqrt{2}}{3A}$

C) $\dfrac{2\sqrt{3} - 2}{A}$

D) $\dfrac{1}{3A}$

E) $\dfrac{\sqrt{2}}{2A}$

9. Compute

$$\lim_{n\to\infty}\left(\sqrt{\frac{n^2+3n}{4n^2+1}}-\frac{3n+1}{e^n}\right)$$

A) 0

B) $\frac{1}{2}-\frac{4}{e}$

C) $\frac{1}{2}$

D) $\frac{1}{4}-\frac{4}{e}$

E) -3

10. Evaluate $\sum_{n=1}^{\infty}\frac{3^{n-1}}{4^n}$

A) $\frac{4}{3}$

B) $\frac{3}{4}$

C) 4

D) 3

E) 1

11. Which of the following series converge?

(I) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{3n^{5/4}}$, (II) $\displaystyle\sum_{n=1}^{\infty} \frac{(\ln n)^2}{n}$, (III) $\displaystyle\sum_{n=1}^{\infty} \frac{2}{n+4}$

A) I

B) I and II

C) I and III

D) All of them

E) None of them

12. Which of the following series converge?

(I) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^2+1}$, (II) $\displaystyle\sum_{n=1}^{\infty} \frac{2n}{n+1}$, (III) $\displaystyle\sum_{n=1}^{\infty} e^{-n}$

A) I

B) I and II

C) III

D) I and III

E) All of them