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

(a) $\frac{3x^5}{x^6+1}$

(b) $\frac{x^3}{x^6+1}$

(c) $\frac{x^3}{x^6+1} - \frac{1}{2}$

(d) $\frac{x}{x^2+1}$

(e) $\frac{x^3}{x^2+1}$

2. $\int_0^{\frac{\pi}{2}} \sin^{3/2} x \, \cos^3 x \, dx =$

(a) $\frac{8}{45}$

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

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

(d) $\frac{11}{45}$

(e) $\frac{13}{45}$

3. If f is continuous and $\int_0^2 f(x)dx = 6$, then $\int_{\frac{1}{3}}^1 f(3x-1)\,dx =$

(a) 2

(b) 18

(c) 17

(d) $\frac{19}{3}$

(e) $\frac{13}{3}$

4. The series $\sum_{n=1}^{\infty} \frac{3^{n-1}}{2^{2n+1}}$ is

(a) convergent and its sum is $\frac{1}{2}$

(b) convergent and its sum is 4

(c) convergent and its sum is $\frac{3}{14}$

(d) convergent and its sum is $\frac{3}{28}$

(e) divergent

5. $\displaystyle\int \frac{x^2}{\sqrt{1-x^2}}\,dx =$

(a) $\displaystyle\frac{1}{2}\sin^{-1} x - \frac{1}{2}x\sqrt{1-x^2} + c$

(b) $\displaystyle\frac{1}{2}\,x\sqrt{1-x^2}\,\sin^{-1} x + c$

(c) $\displaystyle\sin^{-1} x + \frac{3}{2}\,x\sqrt{1-x^2} + c$

(d) $\displaystyle\frac{1}{2}\sin^{-1} x - \frac{1}{6}\,x\sqrt{1-x^2} + c$

(e) $\displaystyle\frac{\sin^{-1} x}{2\sqrt{1-x^2}} + c$

6. $\displaystyle\int_2^3 x(x-2)^{3/2}\,dx =$

(a) $\displaystyle\frac{38}{35}$

(b) $\displaystyle\frac{37}{35}$

(c) $\displaystyle\frac{36}{35}$

(d) $\displaystyle\frac{34}{35}$

(e) $\displaystyle\frac{32}{35}$

7. The series $\sum_{n=0}^{\infty} \frac{e^n}{n!}$

(a) converges by the ratio test

(b) diverges by the ratio test

(c) divergence by the comparison test

(d) diverges by the *nth* term test of divergence

(e) diverges by the integral test

8. The volume of the solid obtained by rotating the region enclosed by the curves $y = \sqrt{x-4}$, $y = 0$ and $x = 8$ about the x-axis is given by

(a) $8\,\pi$

(b) $10\,\pi$

(c) $12\,\pi$

(d) $6\,\pi$

(e) $4\,\pi$

9. The sum of the series

$$1 - (\ln 3) + \frac{(\ln 3)^2}{2!} - \frac{(\ln 3)^3}{3!} + \frac{(\ln 3)^4}{4!} - \dots$$

is

(a) $\frac{1}{3}$

(b) -3

(c) e^{-3}

(d) 3

(e) $\frac{1}{1+\ln 3}$

10. The area of the surface generated by revolving the curve of $y = \cosh x$, $0 \le x \le 1$, about the x-axis is given by

(a) $\int_0^1 2\pi \cosh^2 x \, dx$

(b) $\int_0^1 2\pi \sinh^2 x \, dx$

(c) $\int_0^1 2\pi \cosh x \sqrt{1 + \cosh^2 x} \, dx$

(d) $\int_0^1 2\pi \sinh x \sqrt{1 + \cosh^2 x} \, dx$

(e) $\int_0^1 2\pi \cosh x \, dx$

11. The volume of the solid obtained by rotating the region bounded by $y = x^2 - x^3$ and $y = 0$ about the y-axis is

(a) $\dfrac{\pi}{10}$

(b) $\dfrac{\pi}{20}$

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

(d) $\dfrac{2\pi}{5}$

(e) $\dfrac{\pi}{4}$

12. If $\{S_n\}_{n=1}^{\infty}$ is the sequence of partial sums of the series $\displaystyle\sum_{n=1}^{\infty} \frac{1}{(n+1)(n+2)}$, then $S_n =$

(a) $\dfrac{1}{2} - \dfrac{1}{n+2}$

(b) $\dfrac{1}{n+1} - \dfrac{1}{n+2}$

(c) $\dfrac{1}{2}$

(d) $1 - \dfrac{1}{n+2}$

(e) $1 - \dfrac{1}{n+1}$

13. The first three nonzero terms of the Taylor series of $f(x) = \ln x$ about $a = 1$ are given by

(a) $(x-1) - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3$

(b) $(x-1) + \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3$

(c) $(x-1) + (x-1)^2 - \frac{1}{3}(x-1)^3$

(d) $(x-1) - \frac{1}{2}(x-1)^2 + \frac{1}{6}(x-1)^3$

(e) $\frac{1}{2}(x-1) - \frac{1}{4}(x-1)^2 + \frac{1}{3}(x-1)^3$

14. The improper integral $\int_{-1}^{\infty} \frac{1}{(4+3x)^{3/2}}\,dx$ is

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

(b) equal to 1

(c) equal to $\frac{4}{3}$

(d) equal to $\frac{3}{4}$

(e) divergent

15. The area of the region enclosed by the curves $x = y^2 + 2$ and $x = 4 - y^2$ in the first quadrant is equal to

(a) $\frac{4}{3}$

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

(c) $\frac{3}{4}$

(d) $\frac{4}{5}$

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

16. The sequence $a_n = \left(\frac{n+1}{3n}\right)^n \left(1 - \frac{1}{n}\right)$

(a) converges to 0

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

(c) diverges

(d) converges to 3

(e) converges to $\frac{2}{3}$

17. $\displaystyle\int \frac{-x^2+x+1}{x^3+x}\,dx =$

(a) $\ln|x| - \ln(x^2+1) + \tan^{-1} x + c$

(b) $\ln|x| + 2\ln(x^2+1) + \tan^{-1} x + c$

(c) $\ln 2x + \ln(x^2+1) - \tan^{-1} x + c$

(d) $\ln 2x - \ln(x^2+1) + \tan^{-1} x + c$

(e) $\ln|x| + \ln(x^2+1) - 2\tan^{-1} x + c$

18. The improper integral $\displaystyle\int_{-1}^{1} \frac{1}{\sqrt{|x|}}\,dx$ is

(a) equal to 4

(b) equal to 0

(c) equal to $\dfrac{1}{2}$

(d) equal to 1

(e) divergent

19. The length of the curve $y = \ln\sqrt{\sec 2x}$, $0 \le x \le \dfrac{\pi}{6}$ is

(a) $\ln\sqrt{2+\sqrt{3}}$

(b) $\ln\dfrac{\sqrt{3}}{2}$

(c) $\ln 3$

(d) $\ln(4+2\sqrt{3})$

(e) 2

20. $\dfrac{d}{dx}(\sinh x - \tan^{-1}(\sinh x)) =$

(a) $(\tanh x)(\sinh x)$

(b) $(\coth x)(\cosh x)$

(c) $(\cosh x) - (\sinh x)$

(d) $\tanh^2 x$

(e) $\sinh^2 x - \tanh^2 x$

21. $\int \operatorname{sech} x \, dx =$

(a) $2\tan^{-1}(e^x) + c$

(b) $2\sin^{-1}(e^x) + c$

(c) $\frac{1}{2}\operatorname{sech} x \, \tanh x + c$

(d) $\ln(e^x + e^{-x}) + c$

(e) $\ln(e^{2x} + 1) + c$

22. The sequence $a_n = \frac{1}{n}\int_1^{n^2} \frac{1}{x}\, dx$

(a) converges to 0

(b) converges to 1

(c) diverges

(d) converges to e

(e) converges to 2

23. $\int e^{-\theta}\cos(2\theta)\,d\theta =$

(a) $\frac{2}{5}e^{-\theta}\sin(2\theta) - \frac{1}{5}e^{-\theta}\cos(2\theta) + c$

(b) $\frac{1}{5}e^{-\theta}\sin(2\theta) - \frac{1}{5}e^{-\theta}\cos(2\theta) + c$

(c) $\frac{1}{5}e^{-\theta}\sin(2\theta) - \frac{2}{5}e^{-\theta}\cos(2\theta) + c$

(d) $\frac{2}{5}e^{-\theta}\sin(2\theta) - \frac{2}{5}e^{-\theta}\cos(2\theta) + c$

(e) $\frac{2}{5}e^{-\theta}\sin(2\theta) + \frac{1}{5}e^{-\theta}\cos(2\theta) + c$

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

(a) diverges by the limit comparison test

(b) diverges by the ratio test

(c) converges by the ratio test

(d) converges by the root test

(e) converges by the integral test

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

(a) conditionally convergent

(b) absolutely convergent

(c) convergent and its sum is zero

(d) convergent and its sum is $\ln 2$

(e) divergent

26. The interval of convergent of the series $\sum_{n=1}^{\infty} \frac{(x+1)^n}{n \cdot 2^n}$ is

(a) $[-3, 1)$

(b) $(-3, 1]$

(c) $[-3, 1]$

(d) $\left[-\frac{1}{2}, \frac{1}{2}\right]$

(e) $\left[-\frac{1}{2}, \frac{1}{2}\right)$

27. Let $p(x)$ be the sum of the first five nonzero terms of the Maclaurin series of $(1+x)\cos(2x)$, then $p(1) =$

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

(b) 2

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

(d) 0

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

28. The series $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n^2+4^n}$ is

(a) absolutely convergent

(b) conditionally convergent

(c) divergent

(d) divergent by the alternating series test

(e) convergent by the integral test