1. $\int_0^{\frac{3\sqrt{2}}{4}} \frac{1}{\sqrt{9-4s^2}} ds =$
   A. $\frac{\pi}{8}$
   B. $2\ln 5$
   C. $10\, e^5$
   D. $\sin \frac{3\sqrt{2}}{4}$
   E. $e^{\frac{3\sqrt{2}}{4}}$
2. If $F(x) = \int_1^x f(z)dz$, where $f(x) = \int_1^{x^2} \frac{\sqrt{1+u^2}}{u} du$. Then $\acute{F}(1) =$
   A. $2\sqrt{2}$
   B. $2\sqrt{1+\sqrt{2}}$
   C. $\sqrt{1-\sqrt{2}}$
   D. $\ln\sqrt{2}$
   E. 0
3. The definite integral that represent the area enclosed by $y - x = 1$ and $x = -2y^2$ is
   A. $\int_{-1}^{1/2} [(-2y^2) - (y-1)]\, dy$
   B. $\int_{-1}^{1/2} \left[\left(\sqrt{-\frac{x}{2}}\right)^2 - (x+1)\right] dx$
   C. $\int_0^1 \left[\left(\sqrt{-\frac{x}{2}}\right)^2 - (x+1)\right] dx$
   D. $\pi \int_{-1}^{1/2} [(y-1) - (-2y^2)]\, dy$
   E. $\int_{-2}^{-\frac{1}{2}} \left[\left(\sqrt{-\frac{x}{2}}\right)^2 - (x+1)\right] dx$
4. If f is a continuous function on $[0,1]$ and $\int_0^1 f(x)dx = 2$. Then $\int_0^1 f(1-x)dx =$
   A. 2
   B. 1
   C. 1/2
   D. -1
   E. 0

5. The volume of the solid enclosed by the graph of $y = \sqrt{1-x^2}$ and $y = |x|$, and is revolved about the axis $y = -2$ equals to
   A. $\pi\left\{\int_{-1/\sqrt{2}}^{0} \left[\left(\sqrt{1-x^2}+2\right)^2 - (-x+2)^2\right] dx + \int_0^{1/\sqrt{2}} \left[\left(\sqrt{1-x^2}+2\right)^2 - (x+2)^2\right] dx\right\}$
   B. $\pi\left\{\int_{-1/\sqrt{2}}^{1/\sqrt{2}} \left[\left(\sqrt{1-x^2}+2\right)^2 - (-x+2)^2\right] dx\right\}$
   C. $2\pi\left\{\int_{-\frac{1}{\sqrt{2}}}^{\frac{1}{\sqrt{2}}} x\left[\left(\sqrt{1-x^2}+2\right) - (-x+2)\right] dx\right\}$
   D. $\pi\left\{\int_{-1/\sqrt{2}}^{0} \left[(-x+2)^2 - \left(\sqrt{1-x^2}+2\right)^2\right] dx + \int_0^{1/\sqrt{2}} \left[(-x+2)^2 - \left(\sqrt{1-x^2}+2\right)^2\right] dx\right\}$
   E. $2\pi\left\{\int_{-1/\sqrt{2}}^{1/\sqrt{2}} \left[\left(\sqrt{1-x^2}+2\right)^2 - (-x+2)^2\right] dx\right\}$

6. $\int_1^4 \frac{\ln 2 \log_2 x}{x} dx =$
   A. $2\,(\ln 2)^2$
   B. $2\,e^2$
   C. $\log 2 \ln 2$
   D. 2
   E. 0

7. $\int_0^{\pi/2} 2\sinh(\sin\theta)\cos\theta \; d\theta =$
   A. $e^1 + e^{-1} - 2$
   B. $\cosh e$
   C. 1
   D. $2\ln 2$
   E. $\frac{1}{1+e}$

8. $\int \sec^3 x \tan^3 x \; dx =$
   A. $\frac{1}{5(\cos x)^5} - \frac{1}{3(\cos x)^3} + c$
   B. $5(\cos x)^5 - 3(\cos x)^3 + c$
   C. $5(\csc x)^5 - 3(\mathrm{ccs}\, x)^3 + c$
   D. $5(\cos x)^5 + c$
   E. $\frac{3}{(\cos x)^3} + c$

9. $\int \sin\;(\ln x^2)\; dx =$
   A. $\frac{x}{5}[\sin(\ln x^2) - 2\cos(\ln x^2)]$
   B. $\frac{x}{5}[\sin(\ln x\quad) - 4\cos(\ln x\quad)]$
   C. $x[\sin(\ln x^2) - \cos(\ln x^2)]$
   D. $\frac{4x}{5}[\sin(\ln x^2) + 2\cos(\ln x^2)]$
   E. $\frac{x}{3}[\sin(\ln x^2) + 2\cos(\ln x^2)]$

10. $\int_1^e \frac{dx}{x\sqrt{1+(\ln x)^2}} =$
   A. $\ln(1+\sqrt{2})$
   B. $e^{1+\sqrt{2}}$
   C. $1+\sqrt{2}$
   D. $\frac{\ln(1+\sqrt{2})}{\sqrt{2}}$
   E. $\sqrt{2}$

11. The infinite region in the first quadrant between the curve e^{-x} and the x −axis is revolving about the y −axis. The volume of the resulted solid is
    A. 2π
    B. ∞
    C. $\frac{\pi}{2}$
    D. 2
    E. π

12. The sequence $\left\{2 - \frac{\cos n}{2^n}\right\}_{n=1}^{+\infty}$
    A. Converges to 2
    B. Diverges
    C. Converges to 3
    D. Converges to 1
    E. Converges to 1/2

13. The sum of this series

$$\sum_{n=1}^{\infty} \frac{4}{(4n-3)(4n+1)}$$ is equal to

    A. 1
    B. 2
    C. 3
    D. 4
    E. 5

14. The error in approximating the sum of the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt[4]{n+1}}$ by the sum of the first 79 terms is less than or equal to
    A. $\frac{1}{3}$
    B. $\frac{1}{2}$
    C. $\frac{5}{3}$
    D. $\frac{1}{5}$

15. The series $\sum_{n=2}^{\infty} \frac{(-1)^n}{n \ln n}$
    A. Converges conditionally
    B. Converges absolutely
    C. Diverges
    D. Converges by the integral test
    E. Converges by the root test

16. The interval of convergence I and the radius of convergence R of the power series $\sum_{n=1}^{\infty} \frac{(-x)^n}{4^n n^3}$ are

A. $I = [-4, 4]$ $R = 4$
B. $I = [-3, 3),$ $R = 3$
C. $I = (3, 4),$ $R = \frac{1}{2}$
D. $I = (-4, 4),$ $R = 4$
E. $I = (-4, 4]$, $R = 4$

17. A power series representation for $f(x) = \frac{3x^3}{(x-3)^2}$ is given by

A. $\sum_{n=1}^{\infty} \frac{n}{3^n} x^{n+2}$
B. $\sum_{n=1}^{\infty} \frac{x^{n+3}}{3^n}$
C. $\sum_{n=1}^{\infty} \frac{n}{3^{n+2}} x^n$
D. $\sum_{n=1}^{\infty} \frac{n\, x^n}{3^n}$
E. $\sum_{n=1}^{\infty} \frac{n+2}{3^n} x^n$

18. The power series representation (Maclaurin) for the function $f(x) = \frac{x}{(x-2)^2}$ is (Hint: You may use differentiation)

A. $\sum_{n=1}^{\infty} \frac{n+1}{2^{n+2}} x^{n+1}$
B. $\sum_{n=1}^{\infty} \frac{n+1}{2^{n+2}} x^n$
C. $\sum_{n=1}^{\infty} \frac{n+1}{2^{n+1}} x^{n+1}$
D. $\sum_{n=1}^{\infty} \frac{n}{2^n} x^n$
E. $\sum_{n=1}^{\infty} \frac{n+1}{2} x^{n+1}$

19. The first four terms of the Taylor series of $f(x) = 4 + \ln x$ about $a = 1$ are given by

A. $4 + (x-1) - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3$
B. $4 + 5(x-1) - \frac{3}{2}(x-1)^2 + \frac{1}{3}(x-1)^3$
C. $4 + x - \frac{1}{2}x^2 + \frac{1}{3}x^3$
D. $4 + (x-1) - (x-1)^2 + 2(x-1)^3$
E. $4 + (x+1) - \frac{1}{2}(x+1)^2 + 2(x+1)^3$

20. Let $\{a_n\}$ be a sequence of real numbers. If $a_1 + a_2 + \cdots + a_n = \frac{n^2}{5n^2+9}$, then $\sum_{n=1}^{\infty} \frac{a_n}{2} =$

A. $\frac{1}{10}$
B. $\frac{1}{6}$
C. $\frac{1}{9}$
D. $\frac{1}{2}$
E. $\frac{1}{3}$