[redacted]

1. If the region enclosed by $y = \sin x$ and the x-axis from $x = 0$ to $x = \pi$ is revolved about the vertical line $x = -1$, then the volume of the solid generated is equal to

(a) $2\pi(\pi - 4)$

(b) $2\pi^2$

(c) $2\pi(\pi - 1)$

(d) $2\pi(\pi + 2)$

(e) $2\pi(\pi + 4)$

2. If $a_k = \dfrac{(k!)^2(3^k)}{(2k)!}$ and $\lim\limits_{k\to\infty} \dfrac{a_{k+1}}{a_k} = L$, then the series $\sum\limits_{k=1}^{\infty} a_k$

(a) diverges because $L = \frac{4}{3} > 1$

(b) diverges because $L = 12 > 1$

(c) converges because $L = \frac{3}{4} < 1$

(d) converges because $L = \frac{1}{12} < 1$

(e) may converge or diverge because $L = 1$

3. $\displaystyle\int \frac{3x^2+x+4}{x^3+4x}dx =$

(a) $\ln|x(x^2+4)| + \frac{3}{2}\tan^{-1}\left(\frac{x}{2}\right) + c$

(b) $\ln|x\sqrt{x^2+4}| + c$

(c) $\ln|x\sqrt{x^2+4}| + \frac{3}{2}\tan^{-1}\left(\frac{x}{2}\right) + c$

(d) $\ln|x(x^2+4)| + \frac{1}{2}\tan^{-1}\left(\frac{x}{2}\right) + c$

(e) $\ln|x\sqrt[3]{x^2+4}| + \frac{1}{2}\tan^{-1}\left(\frac{x}{2}\right) + c$

4. If $\left\{S_n\right\}_{n=1}^{+\infty}$ is the sequence of partial sums of the series $\frac{1}{3.5}+\frac{1}{5.7}+\frac{1}{7.9}+\cdots$, then S_n is equal to

(a) $\frac{n+1}{6(2n+3)}$

(b) $\frac{2}{(2n+1)(2n+3)}$

(c) $\frac{n}{3(2n+3)}$

(d) $\frac{6n}{2n+3}$

(e) $\frac{n}{2n+1}$

5. $\displaystyle\int_0^{\ln 2} \frac{\sinh x}{1+\cosh x}\,dx =$

(a) $\ln(9/8)$

(b) $\ln(4/5)$

(c) $\ln(12/7)$

(d) $\ln(15/8)$

(e) $\ln 36$

6. If $a_k = \dfrac{19}{\sqrt[3]{27k^2+5k}}$, $b_k = \dfrac{1}{k^{2/3}}$, and $\lim\limits_{k\to\infty} \dfrac{a_k}{b_k} = L$, then the series $\displaystyle\sum_{k=1}^{\infty} a_k$

(a) converges because $L > 1$ and finite

(b) diverges because $L < 1$ and finite

(c) converges because $L < 1$ and finite

(d) diverges because $L = +\infty$

(e) diverges because $L > 1$ and finite

7. If the integral test is used in the interval $[0, \infty)$ for the series $\sum_{k=0}^{\infty} \frac{1}{1+9k^2}$, then the value of the integral is

(a) $+\infty$, and the series diverges

(b) $\frac{\pi}{9}$, and the series diverges

(c) $\frac{\pi}{6}$, and the series converges

(d) 9π, and the series converges

(e) $\frac{9\pi}{2}$, and the series converges

8. The improper integral $\int_0^e x \ln x \, dx$

(a) diverges

(b) converges and has the value e^2

(c) converges and has the value $4e^2$

(d) converges and has the value $\frac{1}{4}e^2$

(e) oscillates between e^2 and $4e^2$

9. If the area enclosed by the curves $y^2 = x$ and $y = x - 2$ is revolved about the line $x = 4$, then the volume of the solid generated is equal to

(a) $\pi \int_0^4 [(4-x)^2 - (2-x)^2]dx$

(b) $\pi \int_{-1}^2 [(2+y-y^2)^2 dy$

(c) $2\pi \int_1^4 (4-x)(\sqrt{x} - x + 2)dx$

(d) $2\pi \int_1^4 (4-x)(2 - \sqrt{x} + x)dx$

(e) $\pi \int_{-1}^2 [(4-y^2)^2 - (2-y)^2]dy$

10. Which one of the following series is absolutely convergent?

(a) $\sum_{k=1}^{\infty} \frac{(-1)^k}{\sqrt{k}}$

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

(c) $\sum_{k=1}^{\infty} \cos(\pi k)$

(d) $\sum_{k=1}^{\infty} (-1)^k \pi^k$

(e) $\sum_{k=1}^{\infty} (-1)^k e^{-k}$

11. The sequence $\left\{\tan^{-1} n\right\}_{n=1}^{+\infty}$ is

(a) increasing (not strictly) with an upper bound

(b) strictly increasing **without** an upper bound

(c) increasing (not strictly) **without** an upper bound

(d) strictly increasing with an upper bound

(e) neither increasing nor decreasing

12. The radius of convergence R and the interval of convergence I of the power series $\sum_{k=0}^{\infty}(-1)^k \frac{(x-5)^k}{3^k}$ are

(a) $R = \frac{5}{3}$ and $I = (2, 8)$

(b) $R = 3$ and $I = (2, 8)$

(c) $R = 3$ and $I = (2, 8]$

(d) $R = \frac{5}{3}$ and $I = [2, 8)$

(e) $R = 3$ and $I = [2, 8)$

13. The series $\sum_{k=1}^{\infty} 2^{3k} \cdot 3^{1-2k}$

(a) converges and has the sum 8/9

(b) converges and has the sum 3/4

(c) oscillates between 2 and 3

(d) diverges

(e) converges and has the sum 24

14. The sequence $\frac{\ln 3}{\ln 5}, \frac{\ln 6}{\ln 7}, \frac{\ln 9}{\ln 9}, \frac{\ln 12}{\ln 11}, \ldots$

(a) converges to 3/2

(b) converges to 1

(c) converges to 2/3

(d) diverges

(e) oscillates between 2 and 3

15. If the portion of the curve $y = 2\sqrt{x}$ between $x = 0$ and $x = 8$ is revolved about the x-axis, then the area of the resulting surface is equal to

(a) 104π

(b) $\frac{208\pi}{3}$

(c) $\frac{215\pi}{3}$

(d) $\frac{103\pi}{3}$

(e) 16π

16. The value of $\lim_{\max \Delta x_k \to 0} \sum_{k=1}^{n} (\tan x_k^*)^2 (\sec x_k^*)^4 \Delta x_k$ over the interval $\left[0, \frac{\pi}{4}\right]$ is equal to

(a) $\frac{2}{15}$

(b) $\frac{11}{15}$

(c) $\frac{8}{15}$

(d) $\frac{13}{15}$

(e) $\frac{14}{15}$