King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics

MATH 102

Final Exam

173

Wednesday, August 15, 2018

Net Time Allowed: 180 minutes

MASTER VERSION

1. The area of the region bounded by the curves $y = e^x$, $y = e^{2x}$, and $x = \ln 3$ is equal to

(a) 2

(b) 4

(c) 6

(d) 8

(e) 10

2. By the definition of definite integral, $\lim_{n\to\infty} \sum_{i=1}^{n} \frac{2}{n}\left(1 + \frac{2i}{n}\right)^3 =$

(a) 20

(b) 40

(c) 30

(d) 10

(e) 50

3. If $\int_1^7 f(x)\,dx = 7$ and $\int_1^3 2f(x)\,dx = 6$, then $\int_3^7 f(x)\,dx =$

(a) 4

(b) $\frac{7}{2}$

(c) $\frac{3}{8}$

(d) 2

(e) 1

4. If $\int_1^2 x^2\, f(x^3)\,dx = \frac{1}{2}$, then $\int_1^8 f(x)\,dx =$

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

(b) 8

(c) $\frac{1}{4}$

(d) $\frac{1}{12}$

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

5. The average value of $f(x) = \dfrac{1}{1+9x^2}$ on $\left[0, \dfrac{1}{3}\right]$ is

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

(b) $\dfrac{\pi}{2}$

(c) $\dfrac{\pi}{3}$

(d) $\dfrac{2\pi}{3}$

(e) $\dfrac{5\pi}{4}$

6. The sequence $\left\{ n \sin\left(\dfrac{\pi}{n}\right) \right\}$ converges to

(a) π

(b) 0

(c) 1

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

(e) -1

7. The volume of the solid generated by rotating the region bounded by $y = x^3$, $x = 1$, and $y = 0$ about the line $x = 2$ is

(a) $\frac{3\pi}{5}$

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

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

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

(e) $\frac{5\pi}{7}$

8. $\int_{\pi^2/16}^{\pi^2/9} \frac{\sec^2\sqrt{x}\,\tan^2\sqrt{x}}{\sqrt{x}}\,dx =$

(a) $\frac{2}{3}\left(3\sqrt{3}-1\right)$

(b) $\frac{3\sqrt{3}}{2} - 1$

(c) $3(\sqrt{3}+2)$

(d) $2(\frac{\sqrt{3}}{3} - 5)$

(e) $\frac{3\sqrt{3}-1}{3}$

9. Using the "Alternating Series Estimating Theorem", the minimum value of n for which nth partial sums S_n approximates the sum of $\sum_{n=1}^{\infty} (-1)^n \frac{2}{n^2}$ up to 3 decimal places (i.e. $|\text{error}| < 0.005$) is

(a) 20

(b) 16

(c) 18

(d) 22

(e) 10

10. The series $\sum_{n=1}^{\infty} \frac{\cos(n\pi)}{n^{2/3}}$ is

(a) conditionally convergent

(b) absolutely convergent by the Integral Test

(c) divergent

(d) absolutely convergent by the Root Test

(e) absolutely convergent by the Ratio Test

11. $\sum_{n=2}^{\infty} \frac{1}{n(\ln(n))^2}$

(a) converges by the Integral Test

(b) diverges by the Integral Test

(c) diverges by the Root Test

(d) diverges by the Ratio Test

(e) converges by the Ratio Test

12. The series $\sum_{n=1}^{\infty} \frac{n}{n^2+1}$ diverges

(a) by the Limit Comparison Test

(b) by the Divergence Test

(c) by the Root Test

(d) by the Ratio Test

(e) as it is Geometric Series with common ratio $r > 1$

13. Consider the series $\sum_{n=1}^{\infty} a_n$. If the the sequence of partial sums $S_n = 1 - \frac{1}{n}$, for $n \geq 1$, then $\lim_{n\to\infty} a_n =$

(a) 0

(b) 1

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

(d) -1

(e) 2

14. The radius of convergence of $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}(x+2)^n}{n2^n}$ is

(a) 2

(b) 1

(c) 1/2

(d) 4

(e) 1/4

15. $\displaystyle\int_0^2 \frac{1}{2-3x}\,dx =$

(a) diverges

(b) converges to 0

(c) converges to 2

(d) converges to $\dfrac{2}{3}$

(e) converges to 3

16. If $g(x) = \displaystyle\int_0^{2\sin x} \sqrt{4-t^2}\,dt$, then $\displaystyle\lim_{x\to 0}\left[\frac{g'(x)}{\cos\, x}\right] =$

(a) 4

(b) 2

(c) -1

(d) -2

(e) 6

17. $\int_{\frac{2\pi}{3}}^{\pi} \sqrt{\sec^2 x - 1}\, dx =$

(a) $\ln 2$

(b) $-\ln 2$

(c) $\ln \frac{\sqrt{5}}{2}$

(d) $-\ln \frac{\sqrt{5}}{2}$

(e) $-\frac{1}{2}$

18. The power series representation of $\frac{x}{2x^2+1}$, when $x \in \left(\frac{-1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$, is

(a) $\sum_{n=0}^{\infty} (-2)^n x^{2n+1}$

(b) $\sum_{n=0}^{\infty} (-1)^n x^{2n-1}$

(c) $\sum_{n=0}^{\infty} \left(\frac{-1}{2}\right)^n x^{2n}$

(d) $\sum_{n=0}^{\infty} (2)^n x^{2n+2}$

(e) $\sum_{n=0}^{\infty} \left(\frac{-1}{2}\right)^n x^{2n+1}$

19. $\int_1^e (\ln\, x)^2\, dx =$

(a) $e - 2$

(b) $\dfrac{e}{2}$

(c) $2e + 1$

(d) $\ln 2 + e$

(e) 1

20. $\int_3^5 \dfrac{dx}{\sqrt{x^2 - 1}} =$

(a) $\ln\left(\dfrac{5 + 2\sqrt{6}}{3 + 2\sqrt{2}}\right)$

(b) $\ln\left(\dfrac{5 + 3\sqrt{6}}{3 + 4\sqrt{2}}\right)$

(c) $\ln\left(\dfrac{1 + 2\sqrt{6}}{2 + 2\sqrt{2}}\right)$

(d) $\ln\left(\dfrac{5 + 4\sqrt{6}}{3 + 5\sqrt{2}}\right)$

(e) $\ln\left(\dfrac{4 + 2\sqrt{5}}{2 + 2\sqrt{2}}\right)$

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

(a) $\frac{x^2}{2} + x + \ln(x-1)^2 - \ln|x| + C$

(b) $x + \ln(x-1)^2 + \ln|x| + C$

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

(d) $\frac{x^2}{2} + x + \tan^{-1}(x-1)^2 + \ln|x| + C$

(e) $\frac{x^2}{2} - \ln(x-1)^2 - \ln|x| + C$

22. The series $\sum_{n=2}^{\infty} \left(\sin\left(\frac{1}{n^4}\right) + \frac{1}{\ln(n^4)} \right)$ is

(a) divergent because $\sum_{n=2}^{\infty} \frac{1}{\ln(n^4)}$ is divergent and $\sum_{n=2}^{\infty} \sin\left(\frac{1}{n^4}\right)$ is convergent

(b) divergent because $\sum_{n=2}^{\infty} \sin\left(\frac{1}{n^4}\right)$ is divergent

(c) divergent because both $\sum_{n=2}^{\infty} \sin\left(\frac{1}{n^4}\right)$ and $\sum_{n=2}^{\infty} \frac{1}{\ln(n^4)}$ are divergent

(d) divergent by using the Divergence Test

(e) convergent

23. By using the binomial series, the coefficient of x^4 in the power series representation of $\sqrt{4+x^2}$, is

(a) $-\frac{1}{2^6}$

(b) $\frac{1}{2^4}$

(c) $-\frac{1}{4^4}$

(d) $\frac{1}{3^4}$

(e) $-\frac{1}{2}$

24. $\sum_{n=0}^{\infty} 7(-1)^n(0.75)^n =$

(a) 4

(b) 3

(c) 7

(d) 9

(e) 10

25. $\int \tan^{-1}\left(x^3\right)\, dx =$

(a) $\sum_{n=0}^{\infty}(-1)^n \frac{x^{6n+4}}{(6n+4)(2n+1)}$

(b) $\sum_{n=0}^{\infty}(-1)^n \frac{x^{2n+2}}{(2n+2)(2n+1)}$

(c) $\sum_{n=0}^{\infty}(-1)^n \frac{x^{2n+1}}{(2n+1)!}$

(d) $\sum_{n=0}^{\infty} \frac{x^{6n+3}}{(6n+3)(2n+1)}$

(e) $\sum_{n=0}^{\infty}(-1)^n \frac{x^{6n+1}}{(6n+1)(2n+1)}$

26. The curve $y = \sqrt{r^2 - x^2}$, where $0 \leq x \leq \frac{r}{9}$ is rotated about the x-axis. If the surface area generated by the rotating is equal to $2\,\pi$, then $r =$

(a) 3

(b) 4

(c) 2

(d) 6

(e) 9

27. $\sum_{k=0}^{\infty}\left(\int_{k}^{k+1}\frac{1}{1+x^2}\,dx\right) =$

(a) $\pi/2$

(b) π

(c) $\pi/4$

(d) 2π

(e) 0

28. The coefficient of x^4 in Maclaurin series of the function $f(x) = \cos(5x^2)$ is equal to

(a) $\frac{-25}{2}$

(b) $\frac{-5}{4}$

(c) $\frac{24}{5}$

(d) $\frac{-1}{24}$

(e) $\frac{1}{12}$

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CODE 001 **CODE 001**

MATH 102
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173
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Name: ______________________________

ID: ______________ Sec: ______________.

Check that this exam has 28 questions.

Important Instructions:

1. All types of calculators, pagers or mobile phones are NOT allowed during the examination.
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6. The Test Code Number is already bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.
7. When bubbling, make sure that the bubbled space is fully covered.
8. When erasing a bubble, make sure that you do not leave any trace of penciling.

1. By the definition of definite integral, $\lim_{n\to\infty} \sum_{i=1}^{n} \frac{2}{n}\left(1+\frac{2i}{n}\right)^3 =$

(a) 10

(b) 30

(c) 50

(d) 20

(e) 40

2. The sequence $\left\{n \sin\left(\frac{\pi}{n}\right)\right\}$ converges to

(a) 0

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

(c) π

(d) 1

(e) -1

3. If $\int_1^7 f(x)\,dx = 7$ and $\int_1^3 2f(x)\,dx = 6$, then $\int_3^7 f(x)\,dx =$

(a) $\frac{7}{2}$

(b) 1

(c) 4

(d) $\frac{3}{8}$

(e) 2

4. If $\int_1^2 x^2 f(x^3)\,dx = \frac{1}{2}$, then $\int_1^8 f(x)\,dx =$

(a) $\frac{1}{12}$

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

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

(d) 8

(e) $\frac{1}{4}$

5. The area of the region bounded by the curves $y = e^x$, $y = e^{2x}$, and $x = \ln 3$ is equal to

(a) 6

(b) 2

(c) 10

(d) 8

(e) 4

6. The average value of $f(x) = \dfrac{1}{1+9x^2}$ on $\left[0, \dfrac{1}{3}\right]$ is

(a) $\dfrac{\pi}{2}$

(b) $\dfrac{\pi}{3}$

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

(d) $\dfrac{2\pi}{3}$

(e) $\dfrac{5\pi}{4}$

7. $\displaystyle\int_{\pi^2/16}^{\pi^2/9} \frac{\sec^2 \sqrt{x}\,\tan^2 \sqrt{x}}{\sqrt{x}}\,dx =$

(a) $\frac{2}{3}\left(3\sqrt{3}-1\right)$

(b) $\dfrac{3\sqrt{3}-1}{3}$

(c) $\dfrac{3\sqrt{3}}{2}-1$

(d) $2(\dfrac{\sqrt{3}}{3}-5)$

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

8. Using the "Alternating Series Estimating Theorem", the minimum value of n for which nth partial sums S_n approximates the sum of $\sum_{n=1}^{\infty}(-1)^n\dfrac{2}{n^2}$ up to 3 decimal places (i.e. $|\text{error}| < 0.005$) is

(a) 22

(b) 16

(c) 18

(d) 10

(e) 20

9. The series $\sum_{n=1}^{\infty} \frac{n}{n^2+1}$ diverges

(a) by the Ratio Test

(b) as it is Geometric Series with common ratio $r > 1$

(c) by the Root Test

(d) by the Limit Comparison Test

(e) by the Divergence Test

10. The radius of convergence of $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}(x+2)^n}{n2^n}$ is

(a) 2

(b) 4

(c) 1/2

(d) 1

(e) 1/4

11. The series $\sum_{n=1}^{\infty} \frac{\cos(n\pi)}{n^{2/3}}$ is

(a) divergent

(b) absolutely convergent by the Ratio Test

(c) conditionally convergent

(d) absolutely convergent by the Root Test

(e) absolutely convergent by the Integral Test

12. $\int_0^2 \frac{1}{2-3x}\, dx =$

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

(b) converges to 2

(c) converges to 3

(d) converges to 0

(e) diverges

13. Consider the series $\sum_{n=1}^{\infty} a_n$. If the the sequence of partial sums $S_n = 1 - \frac{1}{n}$, for $n \geq 1$, then $\lim_{n\to\infty} a_n =$

(a) 2

(b) $\frac{1}{2}$

(c) 0

(d) 1

(e) -1

14. The volume of the solid generated by rotating the region bounded by $y = x^3$, $x = 1$, and $y = 0$ about the line $x = 2$ is

(a) $\frac{3\pi}{5}$

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

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

(d) $\frac{5\pi}{7}$

(e) $\frac{\pi}{5}$

15. $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n(\ln(n))^2}$

(a) diverges by the Ratio Test

(b) converges by the Integral Test

(c) converges by the Ratio Test

(d) diverges by the Integral Test

(e) diverges by the Root Test

16. The power series representation of $\dfrac{x}{2x^2+1}$, when $x \in \left(\dfrac{-1}{\sqrt{2}}, \dfrac{1}{\sqrt{2}}\right)$, is

(a) $\displaystyle\sum_{n=0}^{\infty} (-2)^n \, x^{2n+1}$

(b) $\displaystyle\sum_{n=0}^{\infty} (-1)^n \, x^{2n-1}$

(c) $\displaystyle\sum_{n=0}^{\infty} (2)^n \, x^{2n+2}$

(d) $\displaystyle\sum_{n=0}^{\infty} \left(\frac{-1}{2}\right)^n x^{2n}$

(e) $\displaystyle\sum_{n=0}^{\infty} \left(\frac{-1}{2}\right)^n x^{2n+1}$

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

(a) $x + \ln(x-1)^2 + \ln|x| + C$

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

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

(d) $\frac{x^2}{2} + x + \ln(x-1)^2 - \ln|x| + C$

(e) $\frac{x^2}{2} - \ln(x-1)^2 - \ln|x| + C$

18. $\int_1^e (\ln x)^2\,dx =$

(a) 1

(b) $\ln 2 + e$

(c) $e - 2$

(d) $2e + 1$

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

19. $\displaystyle\int_{\frac{2\pi}{3}}^{\pi} \sqrt{\sec^2 x - 1}\, dx =$

(a) $\ln \dfrac{\sqrt{5}}{2}$

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

(c) $-\ln \dfrac{\sqrt{5}}{2}$

(d) $-\ln 2$

(e) $\ln 2$

20. $\displaystyle\int_{3}^{5} \frac{dx}{\sqrt{x^2 - 1}} =$

(a) $\ln\left(\dfrac{1+2\sqrt{6}}{2+2\sqrt{2}}\right)$

(b) $\ln\left(\dfrac{5+2\sqrt{6}}{3+2\sqrt{2}}\right)$

(c) $\ln\left(\dfrac{4+2\sqrt{5}}{2+2\sqrt{2}}\right)$

(d) $\ln\left(\dfrac{5+4\sqrt{6}}{3+5\sqrt{2}}\right)$

(e) $\ln\left(\dfrac{5+3\sqrt{6}}{3+4\sqrt{2}}\right)$

21. By using the binomial series, the coefficient of x^4 in the power series representation of $\sqrt{4+x^2}$, is

(a) $-\frac{1}{2}$

(b) $\frac{1}{2^4}$

(c) $-\frac{1}{4^4}$

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

(e) $\frac{1}{3^4}$

22. The series $\sum_{n=2}^{\infty}\left(\sin\left(\frac{1}{n^4}\right)+\frac{1}{\ln(n^4)}\right)$ is

(a) divergent because both $\sum_{n=2}^{\infty}\sin\left(\frac{1}{n^4}\right)$ and $\sum_{n=2}^{\infty}\frac{1}{\ln(n^4)}$ are divergent

(b) divergent because $\sum_{n=2}^{\infty}\sin\left(\frac{1}{n^4}\right)$ is divergent

(c) divergent by using the Divergence Test

(d) convergent

(e) divergent because $\sum_{n=2}^{\infty}\frac{1}{\ln(n^4)}$ is divergent and $\sum_{n=2}^{\infty}\sin\left(\frac{1}{n^4}\right)$ is convergent

23. If $g(x) = \int_0^{2\sin x} \sqrt{4-t^2}\, dt$, then $\lim_{x\to 0}\left[\dfrac{g'(x)}{\cos\, x}\right] =$

(a) 2

(b) -1

(c) 6

(d) 4

(e) 2

24. $\sum_{n=0}^{\infty} 7(-1)^n(0.75)^n =$

(a) 10

(b) 7

(c) 4

(d) 3

(e) 9

25. $\int \tan^{-1}\left(x^3\right)\, dx =$

(a) $\sum_{n=0}^{\infty}(-1)^n \dfrac{x^{6n+1}}{(6n+1)(2n+1)}$

(b) $\sum_{n=0}^{\infty} \dfrac{x^{6n+3}}{(6n+3)(2n+1)}$

(c) $\sum_{n=0}^{\infty}(-1)^n \dfrac{x^{2n+1}}{(2n+1)!}$

(d) $\sum_{n=0}^{\infty}(-1)^n \dfrac{x^{6n+4}}{(6n+4)(2n+1)}$

(e) $\sum_{n=0}^{\infty}(-1)^n \dfrac{x^{2n+2}}{(2n+2)(2n+1)}$

26. $\sum_{k=0}^{\infty}\left(\int_k^{k+1} \dfrac{1}{1+x^2}\, dx\right) =$

(a) π

(b) $\pi/2$

(c) 0

(d) 2π

(e) $\pi/4$

27. The curve $y = \sqrt{r^2 - x^2}$, where $0 \leq x \leq \dfrac{r}{9}$ is rotated about the x-axis. If the surface area generated by the rotating is equal to $2\,\pi$, then $r =$

(a) 4

(b) 9

(c) 2

(d) 3

(e) 6

28. The coefficient of x^4 in Maclaurin series of the function $f(x) = \cos(5x^2)$ is equal to

(a) $\dfrac{-25}{2}$

(b) $\dfrac{1}{12}$

(c) $\dfrac{-5}{4}$

(d) $\dfrac{24}{5}$

(e) $\dfrac{-1}{24}$

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CODE 002 **CODE 002**

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1. The sequence $\left\{n \sin\left(\frac{\pi}{n}\right)\right\}$ converges to

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

(b) -1

(c) 0

(d) π

(e) 1

2. By the definition of definite integral, $\lim_{n\to\infty} \sum_{i=1}^{n} \frac{2}{n}\left(1+\frac{2i}{n}\right)^3 =$

(a) 20

(b) 10

(c) 30

(d) 40

(e) 50

3. If $\int_1^7 f(x)\,dx = 7$ and $\int_1^3 2f(x)\,dx = 6$, then $\int_3^7 f(x)\,dx =$

(a) 1

(b) $\frac{7}{2}$

(c) 2

(d) $\frac{3}{8}$

(e) 4

4. If $\int_1^2 x^2 f(x^3)\,dx = \frac{1}{2}$, then $\int_1^8 f(x)\,dx =$

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

(b) 8

(c) $\frac{1}{12}$

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

(e) $\frac{1}{4}$

5. The area of the region bounded by the curves $y = e^x$, $y = e^{2x}$, and $x = \ln 3$ is equal to

(a) 10

(b) 8

(c) 2

(d) 6

(e) 4

6. The average value of $f(x) = \dfrac{1}{1+9x^2}$ on $\left[0, \dfrac{1}{3}\right]$ is

(a) $\dfrac{5\pi}{4}$

(b) $\dfrac{\pi}{2}$

(c) $\dfrac{2\pi}{3}$

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

(e) $\dfrac{\pi}{3}$

7. The radius of convergence of $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}(x+2)^n}{n2^n}$ is

(a) 4

(b) 2

(c) 1

(d) 1/2

(e) 1/4

8. The series $\sum_{n=1}^{\infty} \frac{n}{n^2+1}$ diverges

(a) as it is Geometric Series with common ratio $r > 1$

(b) by the Root Test

(c) by the Ratio Test

(d) by the Limit Comparison Test

(e) by the Divergence Test

9. The volume of the solid generated by rotating the region bounded by $y = x^3$, $x = 1$, and $y = 0$ about the line $x = 2$ is

(a) $\frac{3\pi}{5}$

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

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

(d) $\frac{5\pi}{7}$

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

10. Consider the series $\sum_{n=1}^{\infty} a_n$. If the the sequence of partial sums $S_n = 1 - \frac{1}{n}$, for $n \geq 1$, then $\lim_{n\to\infty} a_n =$

(a) 2

(b) $\frac{1}{2}$

(c) -1

(d) 0

(e) 1

11. $\displaystyle\int_{\pi^2/16}^{\pi^2/9} \frac{\sec^2\sqrt{x}\,\tan^2\sqrt{x}}{\sqrt{x}}\,dx =$

(a) $\dfrac{3\sqrt{3}-1}{3}$

(b) $\dfrac{3\sqrt{3}}{2}-1$

(c) $2(\dfrac{\sqrt{3}}{3}-5)$

(d) $\dfrac{2}{3}\left(3\sqrt{3}-1\right)$

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

12. The series $\displaystyle\sum_{n=1}^{\infty}\frac{\cos(n\pi)}{n^{2/3}}$ is

(a) absolutely convergent by the Root Test

(b) absolutely convergent by the Ratio Test

(c) conditionally convergent

(d) absolutely convergent by the Integral Test

(e) divergent

13. $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n(\ln(n))^2}$

(a) diverges by the Root Test

(b) converges by the Integral Test

(c) diverges by the Integral Test

(d) diverges by the Ratio Test

(e) converges by the Ratio Test

14. Using the "Alternating Series Estimating Theorem", the minimum value of n for which nth partial sums S_n approximates the sum of $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{2}{n^2}$ up to 3 decimal places (i.e. $|\text{error}| < 0.005$) is

(a) 16

(b) 10

(c) 20

(d) 18

(e) 22

15. $\int_0^2 \frac{1}{2-3x}\,dx =$

(a) converges to 3

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

(c) converges to 2

(d) diverges

(e) converges to 0

16. By using the binomial series, the coefficient of x^4 in the power series representation of $\sqrt{4+x^2}$, is

(a) $\frac{1}{3^4}$

(b) $-\frac{1}{2}$

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

(d) $\frac{1}{2^4}$

(e) $-\frac{1}{4^4}$

17. The power series representation of $\dfrac{x}{2x^2+1}$, when $x \in \left(\dfrac{-1}{\sqrt{2}}, \dfrac{1}{\sqrt{2}}\right)$, is

(a) $\sum\limits_{n=0}^{\infty} (2)^n \, x^{2n+2}$

(b) $\sum\limits_{n=0}^{\infty} (-2)^n \, x^{2n+1}$

(c) $\sum\limits_{n=0}^{\infty} (-1)^n \, x^{2n-1}$

(d) $\sum\limits_{n=0}^{\infty} \left(\dfrac{-1}{2}\right)^n \, x^{2n+1}$

(e) $\sum\limits_{n=0}^{\infty} \left(\dfrac{-1}{2}\right)^n \, x^{2n}$

18. If $g(x) = \int_0^{2\sin x} \sqrt{4-t^2}\, dt$, then $\lim\limits_{x\to 0} \left[\dfrac{g'(x)}{\cos\, x}\right] =$

(a) 4

(b) -1

(c) 2

(d) 2

(e) 6

19. $\int_{\frac{2\pi}{3}}^{\pi} \sqrt{\sec^2 x - 1}\, dx =$

(a) $-\ln 2$

(b) $\ln 2$

(c) $\ln \frac{\sqrt{5}}{2}$

(d) $-\frac{1}{2}$

(e) $-\ln \frac{\sqrt{5}}{2}$

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

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

(b) $\frac{x^2}{2} - \ln(x-1)^2 - \ln|x| + C$

(c) $\frac{x^2}{2} + x + \ln(x-1)^2 - \ln|x| + C$

(d) $x + \ln(x-1)^2 + \ln|x| + C$

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

21. $\displaystyle\int_3^5 \frac{dx}{\sqrt{x^2-1}} =$

(a) $\ln\left(\dfrac{5+2\sqrt{6}}{3+2\sqrt{2}}\right)$

(b) $\ln\left(\dfrac{4+2\sqrt{5}}{2+2\sqrt{2}}\right)$

(c) $\ln\left(\dfrac{5+4\sqrt{6}}{3+5\sqrt{2}}\right)$

(d) $\ln\left(\dfrac{1+2\sqrt{6}}{2+2\sqrt{2}}\right)$

(e) $\ln\left(\dfrac{5+3\sqrt{6}}{3+4\sqrt{2}}\right)$

22. $\displaystyle\int_1^e (\ln\, x)^2\, dx =$

(a) $\ln 2 + e$

(b) 1

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

(d) $2e+1$

(e) $e-2$

23. The series $\sum_{n=2}^{\infty}\left(\sin\left(\frac{1}{n^4}\right)+\frac{1}{\ln(n^4)}\right)$ is

(a) divergent because both $\sum_{n=2}^{\infty}\sin\left(\frac{1}{n^4}\right)$ and $\sum_{n=2}^{\infty}\frac{1}{\ln(n^4)}$ are divergent

(b) convergent

(c) divergent because $\sum_{n=2}^{\infty}\sin\left(\frac{1}{n^4}\right)$ is divergent

(d) divergent by using the Divergence Test

(e) divergent because $\sum_{n=2}^{\infty}\frac{1}{\ln(n^4)}$ is divergent and $\sum_{n=2}^{\infty}\sin\left(\frac{1}{n^4}\right)$ is convergent

24. $\int \tan^{-1}\left(x^3\right)\,dx =$

(a) $\sum_{n=0}^{\infty}\frac{x^{6n+3}}{(6n+3)(2n+1)}$

(b) $\sum_{n=0}^{\infty}(-1)^n\frac{x^{6n+4}}{(6n+4)(2n+1)}$

(c) $\sum_{n=0}^{\infty}(-1)^n\frac{x^{2n+1}}{(2n+1)!}$

(d) $\sum_{n=0}^{\infty}(-1)^n\frac{x^{6n+1}}{(6n+1)(2n+1)}$

(e) $\sum_{n=0}^{\infty}(-1)^n\frac{x^{2n+2}}{(2n+2)(2n+1)}$

25. $\sum_{k=0}^{\infty} \left(\int_k^{k+1} \frac{1}{1+x^2}\, dx \right) =$

(a) 0

(b) π

(c) $\pi/4$

(d) $\pi/2$

(e) 2π

26. $\sum_{n=0}^{\infty} 7(-1)^n (0.75)^n =$

(a) 9

(b) 10

(c) 7

(d) 3

(e) 4

27. The curve $y = \sqrt{r^2 - x^2}$, where $0 \le x \le \dfrac{r}{9}$ is rotated about the x-axis. If the surface area generated by the rotating is equal to 2π, then $r =$

(a) 6

(b) 4

(c) 9

(d) 3

(e) 2

28. The coefficient of x^4 in Maclaurin series of the function $f(x) = \cos(5x^2)$ is equal to

(a) $\dfrac{-25}{2}$

(b) $\dfrac{-1}{24}$

(c) $\dfrac{-5}{4}$

(d) $\dfrac{1}{12}$

(e) $\dfrac{24}{5}$