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

Math 102
Final Exam
Term 133
Wednesday 13/08/2014

EXAM COVER

Number of versions: 4
Number of questions: 28
Number of Answers: 5 per question

This exam was prepared using mcqs
For questions send an email to Dr. Ibrahim Al-Lehyani (iallehyani@kaau.edu.sa)

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

Math 102
Final Exam
Term 133
Wednesday 13/08/2014
Net Time Allowed: 180 minutes

MASTER VERSION

1. If $F(x) = \int_2^x \sqrt{3t^2+1}\, dt$, then $F'(2)F''(2) =$

(a) 6

(b) 0

(c) 4

(d) 3

(e) 12

2. if f is continuous and $\int_1^3 f(2x+1)\, dx = 4$, then $\int_3^7 f(x) dx =$

(a) 8

(b) 2

(c) 4

(d) 6

(e) 10

3. The area of the region bounded by the line $y = \frac{1}{2}x$ and the parabola $y^2 = 8 - x$ is equal to

(a) 36

(b) 34

(c) 32

(d) 30

(e) 28

4. The length of the curve $y = \ln(\cos x)$, $0 \leq x \leq \frac{\pi}{4}$ is

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

(b) $\ln\left(1 + \sqrt{3}\right)$

(c) $\ln\left(1 - \sqrt{2}\right)$

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

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

5. The improper integral $\int_0^1 \frac{2}{(1-x)^3}\,dx$ is

(a) divergent

(b) equal to -1

(c) equal to 2

(d) equal to -2

(e) equal to 0

6. $\int_0^{\frac{\pi}{6}} \frac{\cos^2 x}{\sqrt{1+\cos 2x}}\,dx =$

(a) $\frac{\sqrt{2}}{4}$

(b) $\frac{\sqrt{3}}{4}$

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

(d) $\frac{\sqrt{2}}{2}$

(e) 0

7. The sum of the series $\sum_{n=0}^{\infty} \frac{2\,(-1)^n\,\pi^{2n}}{4^{2n}(2n)!}$ is equal to

(a) $\sqrt{2}$

(b) $\sqrt{3}$

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

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

(e) 2

8. The sequence $a_n = 3\sin^{-1}\sqrt{\frac{3n-1}{4n+1}}$

(a) converges to π

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

(c) converges to $\frac{\pi}{2}$

(d) converges to $\frac{\pi}{4}$

(e) diverges

9. $\int_0^1 x^3 e^x \, dx =$

(a) $6 - 2e$

(b) $6 + 2e$

(c) $6 + 3e$

(d) $6 - 4e$

(e) $6 - 3e$

10. The series $\sum_{n=0}^{\infty} \frac{2^n 3^n}{n!}$ is

(a) convergent by ratio test and its sum is e^6

(b) divergent by ratio test

(c) a series where the ratio test is inconclusive

(d) divergent by the root test

(e) convergent by ratio test and its sum is 0

11. The interval of convergence of the series $\sum_{n=1}^{\infty} \frac{(x-1)^{2n}}{4^n}$ is

(a) $(-1, 3)$

(b) $[-1, 3]$

(c) $[-1, 3)$

(d) $(-1, 3]$

(e) $(-\infty, \infty)$

12. The volume of the solid obtained by rotating the region enclosed by the curves $x = y^2$ and $y = x^3$ about the x-axis is equal to

(a) $\frac{5\pi}{14}$

(b) $\frac{3\pi}{14}$

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

(d) $\frac{3\pi}{7}$

(e) 2π

13. The smallest number of terms, needed in order to find the sum of the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^{4/3}}$ with $|\,error| < 0.0001$, is

(a) 1000

(b) 100

(c) 10000

(d) 10

(e) 400

14. $\displaystyle\int \frac{10}{(x-1)(x^2+9)}\,dx =$

(a) $\ln|x-1| - \frac{1}{2}\ln(x^2+9) - \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

(b) $\ln|x-1| - \frac{1}{3}\ln(x^2+9) + \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

(c) $\ln|x-1| + \frac{1}{2}\ln(x^2+9) + \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

(d) $\ln|x-1| + \frac{1}{3}\ln(x^2+9) - \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

(e) $\ln|x-1| - \frac{1}{3}\ln(x^2+9) - \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

15. If $x > 3$, then $\int \frac{\sqrt{x^2-9}}{x^3}\,dx =$

(a) $\frac{1}{6}\sec^{-1}\left(\frac{x}{3}\right) - \frac{\sqrt{x^2-9}}{2x^2} + c$

(b) $\frac{1}{6}\sec^{-1}\left(\frac{x}{3}\right) + \frac{\sqrt{x^2-9}}{2x} + c$

(c) $\frac{1}{3}\sec^{-1}\left(\frac{x}{3}\right) - \frac{\sqrt{x^2-9}}{2x^2} + c$

(d) $\frac{1}{3}\sec^{-1}\left(\frac{x}{3}\right) + \frac{\sqrt{x^2-9}}{x^2} + c$

(e) $\frac{1}{6}\sec^{-1}\left(\frac{x}{2}\right) + \frac{\sqrt{x^2-9}}{2x} + c$

16. The area of the surface generated by revolving the curve of $y = \cos x, 0 \le x \le 1$, about the x-axis is give by

(a) $\int_0^1 2\pi \cos x\, \sqrt{1+\sin^2 x}\,dx$

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

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

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

(e) $\int_0^1 2\pi \cos x\, \sqrt{1+\sin x}\,dx$

17. The volume V of the solid generated by revolving around the y-axis the region in the first quadrant under the curve $y = 3x^2 - x^3$ from $x = 0$ to $x = 3$ is given by

(a) $V = 2\pi \int_0^3 (3x^3 - x^4)\, dx$

(b) $V = \pi \int_0^3 (3x^2 - x^3)\, dx$

(c) $V = \pi \int_0^3 (9x^4 - x^9)\, dx$

(d) $V = 2\pi \int_0^3 (3x^2 - x^3)\, dx$

(e) $V = 2\pi \int_0^3 (x^4 - 3x^2)\, dx$

18. The improper integral $\int_1^\infty \frac{\ln x}{x^2}\, dx$ is

(a) equal to 1

(b) equal to 2

(c) equal to 3

(d) equal to -1

(e) divergent

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

(a) conditionally convergent

(b) absolutely convergent

(c) convergent and its sum is 0

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

(e) divergent

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

(a) diverges by the integral test

(b) diverges by the ratio test

(c) converges by the ratio test

(d) converges by the integral test

(e) diverges by the n_{th} − term test of divergence.

21. $\displaystyle\int \frac{\sin x}{\cos^2 x - 16}\, dx =$

(a) $\dfrac{1}{8}\ln\left|\dfrac{4+\cos x}{\cos x - 4}\right| + c$

(b) $\dfrac{1}{4}\ln\left|\dfrac{4+\cos x}{\cos x - 2}\right| + c$

(c) $\dfrac{1}{8}\ln\left|\dfrac{4+\sin x}{\sin x - 4}\right| + c$

(d) $\dfrac{1}{4}\ln\left|\dfrac{4-\cos x}{\cos x + 4}\right| + c$

(e) $\dfrac{1}{16}\ln\left|\dfrac{4+\sin x}{\sin x - 4}\right| + c$

22. If the sequence defined by $a_1 = -4, a_{n+1} = \sqrt{8+2a_n}$ is convergent to L, then $L=$

(a) 4

(b) -2

(c) -4

(d) 2

(e) 6

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

(a) Absolutely convergent

(b) Conditionally convergent

(c) Divergent by Comparison test

(d) Divergent by n_{th}term test of divergence

(e) Convergent geometric series

24. The first three nonzero terms of the Taylor series of $f(x) = \sin x$ about $a = \frac{\pi}{4}$ are given by

(a) $\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}\left(x - \frac{\pi}{4}\right) - \frac{\sqrt{2}}{4}\left(x - \frac{\pi}{4}\right)^2$

(b) $\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{4}\left(x - \frac{\pi}{4}\right) - \frac{\sqrt{2}}{8}\left(x - \frac{\pi}{4}\right)^2$

(c) $\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}\left(x - \frac{\pi}{4}\right) + \frac{\sqrt{2}}{2}\left(x - \frac{\pi}{4}\right)^2$

(d) $\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}\left(x - \frac{\pi}{4}\right) - \frac{\sqrt{2}}{4}\left(x - \frac{\pi}{4}\right)^2$

(e) $\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}\left(x - \frac{\pi}{4}\right) - \sqrt{2}\left(x - \frac{\pi}{4}\right)^2$

25. If $ax + bx^2 + cx^3$ is the sum of the first three terms of the Maclaurin series of $e^{3x} \sin 2x$, then $6c - a - b =$

(a) 11

(b) 12

(c) 13

(d) 14

(e) 15

26. The series $\sum_{n=1}^{\infty} \frac{e^{n-1} - e^n}{e^{2n-1}}$ is

(a) convergent and its sum is -1

(b) convergent and its sum is 1

(c) convergent and its sum is 0

(d) convergent and its sum is e

(e) divergent

27. If $f(x) = \coth(\ln x)$, then $f'(2) =$

(a) $-\dfrac{8}{9}$

(b) $\dfrac{16}{9}$

(c) $-\dfrac{16}{9}$

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

(e) $\dfrac{9}{16}$

28. The Maclaurin series of the function $f(x) = \dfrac{x^2}{(x+1)^2}$ is given by

(a) $\sum_{n=1}^{\infty} (-1)^{n+1} n x^{n+1}, \ |x| < 1$

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

(c) $\sum_{n=0}^{\infty} (-1)^{n} n\, x^{n-1}, \ |x| < 1$

(d) $\sum_{n=0}^{\infty} (-1)^{n} n\, x^{n+3}, \ |x| < 1$

(e) $\sum_{n=0}^{\infty} (-1)^{n} x^{n+1}, \ |x| < 1$

King Fahd University of Petroleum and Minerals
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CODE 001 **Math 102** **CODE 001**

Math 102
Final Exam
Term 133
Wednesday 13/08/2014
Net Time Allowed: 180 minutes

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.
2. Use HB 2.5 pencils only.
3. Use a good eraser. DO NOT use the erasers attached to the pencil.
4. Write your name, ID number and Section number on the examination paper and in the upper left corner of the answer sheet.
5. When bubbling your ID number and Section number, be sure that the bubbles match with the numbers that you write.
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. The length of the curve $y = \ln(\cos x)$, $0 \leq x \leq \frac{\pi}{4}$ is

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

(b) $\ln\left(1 + \sqrt{2}\right)$

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

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

(e) $\ln\left(1 + \sqrt{3}\right)$

2. The area of the region bounded by the line $y = \frac{1}{2}x$ and the parabola $y^2 = 8 - x$ is equal to

(a) 36

(b) 32

(c) 30

(d) 34

(e) 28

3. The improper integral $\int_0^1 \frac{2}{(1-x)^3}\,dx$ is

(a) equal to -2

(b) equal to 0

(c) equal to 2

(d) divergent

(e) equal to -1

4. if f is continuous and $\int_1^3 f(2x+1)\,dx = 4$, then $\int_3^7 f(x)dx =$

(a) 2

(b) 8

(c) 6

(d) 10

(e) 4

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

(a) 6

(b) 0

(c) 4

(d) 12

(e) 3

6. $\int_{0}^{\frac{\pi}{6}} \frac{\cos^2 x}{\sqrt{1+\cos 2x}}\, dx =$

(a) $\frac{\sqrt{2}}{4}$

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

(c) 0

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

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

7. The sequence $a_n = 3\sin^{-1}\sqrt{\dfrac{3n-1}{4n+1}}$

(a) diverges

(b) converges to π

(c) converges to $\dfrac{\pi}{2}$

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

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

8. The interval of convergence of the series $\displaystyle\sum_{n=1}^{\infty} \frac{(x-1)^{2n}}{4^n}$ is

(a) $[-1, 3]$

(b) $(-1, 3]$

(c) $(-\infty, \infty)$

(d) $[-1, 3)$

(e) $(-1, 3)$

9. The volume of the solid obtained by rotating the region enclosed by the curves $x = y^2$ and $y = x^3$ about the x-axis is equal to

(a) $\dfrac{3\pi}{7}$

(b) $\dfrac{5\pi}{7}$

(c) $\dfrac{5\pi}{14}$

(d) $2\,\pi$

(e) $\dfrac{3\pi}{14}$

10. $\displaystyle\int_0^1 x^3 e^x \, dx =$

(a) $6 - 2e$

(b) $6 - 3e$

(c) $6 - 4e$

(d) $6 + 2e$

(e) $6 + 3e$

11. The smallest number of terms, needed in order to find the sum of the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^{4/3}}$ with $|\,error| < 0.0001$, is

(a) 400

(b) 10000

(c) 10

(d) 1000

(e) 100

12. The series $\sum_{n=0}^{\infty} \frac{2^n 3^n}{n!}$ is

(a) divergent by the root test

(b) a series where the ratio test is inconclusive

(c) divergent by ratio test

(d) convergent by ratio test and its sum is 0

(e) convergent by ratio test and its sum is e^6

13. The sum of the series $\sum_{n=0}^{\infty} \frac{2\,(-1)^n\,\pi^{2n}}{4^{2n}(2n)!}$ is equal to

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

(b) $\sqrt{3}$

(c) $\sqrt{2}$

(d) 2

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

14. $\int \frac{10}{(x-1)(x^2+9)}\,dx =$

(a) $\ln|x-1| - \frac{1}{2}\ln(x^2+9) - \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

(b) $\ln|x-1| - \frac{1}{3}\ln(x^2+9) + \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

(c) $\ln|x-1| + \frac{1}{2}\ln(x^2+9) + \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

(d) $\ln|x-1| + \frac{1}{3}\ln(x^2+9) - \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

(e) $\ln|x-1| - \frac{1}{3}\ln(x^2+9) - \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

15. If $x > 3$, then $\int \frac{\sqrt{x^2-9}}{x^3}\,dx =$

(a) $\frac{1}{6}\sec^{-1}\left(\frac{x}{3}\right) + \frac{\sqrt{x^2-9}}{2x} + c$

(b) $\frac{1}{3}\sec^{-1}\left(\frac{x}{3}\right) - \frac{\sqrt{x^2-9}}{2x^2} + c$

(c) $\frac{1}{3}\sec^{-1}\left(\frac{x}{3}\right) + \frac{\sqrt{x^2-9}}{x^2} + c$

(d) $\frac{1}{6}\sec^{-1}\left(\frac{x}{3}\right) - \frac{\sqrt{x^2-9}}{2x^2} + c$

(e) $\frac{1}{6}\sec^{-1}\left(\frac{x}{2}\right) + \frac{\sqrt{x^2-9}}{2x} + c$

16. The volume V of the solid generated by revolving around the y-axis the region in the first quadrant under the curve $y = 3x^2 - x^3$ from $x = 0$ to $x = 3$ is given by

(a) $V = 2\pi \int_0^3 (x^4 - 3x^2)\,dx$

(b) $V = \pi \int_0^3 (9x^4 - x^9)\,dx$

(c) $V = \pi \int_0^3 (3x^2 - x^3)\,dx$

(d) $V = 2\pi \int_0^3 (3x^2 - x^3)\,dx$

(e) $V = 2\pi \int_0^3 (3x^3 - x^4)\,dx$

17. The improper integral $\int_1^{\infty} \frac{\ln x}{x^2}\,dx$ is

(a) equal to 2

(b) equal to -1

(c) equal to 3

(d) equal to 1

(e) divergent

18. $\int \frac{\sin x}{\cos^2 x - 16}\,dx =$

(a) $\frac{1}{4} \ln \left| \frac{4 - \cos x}{\cos x + 4} \right| + c$

(b) $\frac{1}{16} \ln \left| \frac{4 + \sin x}{\sin x - 4} \right| + c$

(c) $\frac{1}{8} \ln \left| \frac{4 + \cos x}{\cos x - 4} \right| + c$

(d) $\frac{1}{8} \ln \left| \frac{4 + \sin x}{\sin x - 4} \right| + c$

(e) $\frac{1}{4} \ln \left| \frac{4 + \cos x}{\cos x - 2} \right| + c$

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

(a) converges by the ratio test

(b) diverges by the ratio test

(c) diverges by the integral test

(d) converges by the integral test

(e) diverges by the n_{th} − term test of divergence.

20. If the sequence defined by $a_1 = -4, a_{n+1} = \sqrt{8 + 2a_n}$ is convergent to L, then L=

(a) 2

(b) -2

(c) -4

(d) 4

(e) 6

21. The area of the surface generated by revolving the curve of $y = \cos x, 0 \leq x \leq 1$, about the x-axis is give by

(a) $\int_0^1 2\pi \sin x \, \sqrt{1 + \cos^2 x} \, dx$

(b) $\int_0^1 2\pi \cos x \, \sqrt{1 + \sin x} \, dx$

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

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

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

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

(a) divergent

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

(c) conditionally convergent

(d) convergent and its sum is 0

(e) absolutely convergent

23. The first three nonzero terms of the Taylor series of $f(x) = \sin x$ about $a = \dfrac{\pi}{4}$ are given by

(a) $\dfrac{\sqrt{2}}{2} + \dfrac{\sqrt{2}}{2}\left(x - \dfrac{\pi}{4}\right) - \dfrac{\sqrt{2}}{4}\left(x - \dfrac{\pi}{4}\right)^2$

(b) $\dfrac{\sqrt{2}}{2} - \dfrac{\sqrt{2}}{2}\left(x - \dfrac{\pi}{4}\right) - \dfrac{\sqrt{2}}{4}\left(x - \dfrac{\pi}{4}\right)^2$

(c) $\dfrac{\sqrt{2}}{2} - \dfrac{\sqrt{2}}{4}\left(x - \dfrac{\pi}{4}\right) - \dfrac{\sqrt{2}}{8}\left(x - \dfrac{\pi}{4}\right)^2$

(d) $\dfrac{\sqrt{2}}{2} + \dfrac{\sqrt{2}}{2}\left(x - \dfrac{\pi}{4}\right) - \sqrt{2}\left(x - \dfrac{\pi}{4}\right)^2$

(e) $\dfrac{\sqrt{2}}{2} + \dfrac{\sqrt{2}}{2}\left(x - \dfrac{\pi}{4}\right) + \dfrac{\sqrt{2}}{2}\left(x - \dfrac{\pi}{4}\right)^2$

24. The Maclaurin series of the function $f(x) = \dfrac{x^2}{(x+1)^2}$ is given by

(a) $\sum_{n=1}^{\infty} (-1)^{n+1} n x^{n+1}, \ |x| < 1$

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

(c) $\sum_{n=0}^{\infty} (-1)^{n} x^{n+1}, \ |x| < 1$

(d) $\sum_{n=0}^{\infty} (-1)^{n} x^{n+2}, \ |x| < 1$

(e) $\sum_{n=0}^{\infty} (-1)^{n} n\, x^{n+3}, \ |x| < 1$

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

(a) Divergent by n_{th}term test of divergence

(b) Conditionally convergent

(c) Absolutely convergent

(d) Convergent geometric series

(e) Divergent by Comparison test

26. The series $\sum_{n=1}^{\infty} \frac{e^{n-1} - e^n}{e^{2n-1}}$ is

(a) convergent and its sum is 0

(b) convergent and its sum is -1

(c) convergent and its sum is e

(d) convergent and its sum is 1

(e) divergent

27. If $ax + bx^2 + cx^3$ is the sum of the first three terms of the Maclaurin series of $e^{3x}\sin 2x$, then $6c - a - b =$

(a) 14

(b) 12

(c) 15

(d) 13

(e) 11

28. If $f(x) = \coth(\ln x)$, then $f'(2) =$

(a) $-\dfrac{16}{9}$

(b) $-\dfrac{8}{9}$

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

(d) $\dfrac{16}{9}$

(e) $\dfrac{9}{16}$

Name ....

ID .... Sec ....

1	a	b	c	d	e	f
2	a	b	c	d	e	f
3	a	b	c	d	e	f
4	a	b	c	d	e	f
5	a	b	c	d	e	f
6	a	b	c	d	e	f
7	a	b	c	d	e	f
8	a	b	c	d	e	f
9	a	b	c	d	e	f
10	a	b	c	d	e	f
11	a	b	c	d	e	f
12	a	b	c	d	e	f
13	a	b	c	d	e	f
14	a	b	c	d	e	f
15	a	b	c	d	e	f
16	a	b	c	d	e	f
17	a	b	c	d	e	f
18	a	b	c	d	e	f
19	a	b	c	d	e	f
20	a	b	c	d	e	f
21	a	b	c	d	e	f
22	a	b	c	d	e	f
23	a	b	c	d	e	f
24	a	b	c	d	e	f
25	a	b	c	d	e	f
26	a	b	c	d	e	f
27	a	b	c	d	e	f
28	a	b	c	d	e	f
29	a	b	c	d	e	f
30	a	b	c	d	e	f
31	a	b	c	d	e	f
32	a	b	c	d	e	f
33	a	b	c	d	e	f
34	a	b	c	d	e	f
35	a	b	c	d	e	f

36	a	b	c	d	e	f
37	a	b	c	d	e	f
38	a	b	c	d	e	f
39	a	b	c	d	e	f
40	a	b	c	d	e	f
41	a	b	c	d	e	f
42	a	b	c	d	e	f
43	a	b	c	d	e	f
44	a	b	c	d	e	f
45	a	b	c	d	e	f
46	a	b	c	d	e	f
47	a	b	c	d	e	f
48	a	b	c	d	e	f
49	a	b	c	d	e	f
50	a	b	c	d	e	f
51	a	b	c	d	e	f
52	a	b	c	d	e	f
53	a	b	c	d	e	f
54	a	b	c	d	e	f
55	a	b	c	d	e	f
56	a	b	c	d	e	f
57	a	b	c	d	e	f
58	a	b	c	d	e	f
59	a	b	c	d	e	f
60	a	b	c	d	e	f
61	a	b	c	d	e	f
62	a	b	c	d	e	f
63	a	b	c	d	e	f
64	a	b	c	d	e	f
65	a	b	c	d	e	f
66	a	b	c	d	e	f
67	a	b	c	d	e	f
68	a	b	c	d	e	f
69	a	b	c	d	e	f
70	a	b	c	d	e	f

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

CODE 002 **Math 102** **CODE 002**

Final Exam

Term 133

Wednesday 13/08/2014

Net Time Allowed: 180 minutes

Name: ______________________________

ID: ______________ Sec: ______________.

Check that this exam has <u>28</u> questions.

Important Instructions:

1. All types of calculators, pagers or mobile phones are NOT allowed during the examination.
2. Use HB 2.5 pencils only.
3. Use a good eraser. DO NOT use the erasers attached to the pencil.
4. Write your name, ID number and Section number on the examination paper and in the upper left corner of the answer sheet.
5. When bubbling your ID number and Section number, be sure that the bubbles match with the numbers that you write.
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. The improper integral $\int_0^1 \frac{2}{(1-x)^3}\,dx$ is

(a) equal to -1

(b) equal to -2

(c) equal to 2

(d) equal to 0

(e) divergent

2. $\int_0^{\frac{\pi}{6}} \frac{\cos^2 x}{\sqrt{1+\cos 2x}}\,dx =$

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

(b) $\frac{\sqrt{3}}{4}$

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

(d) $\frac{\sqrt{2}}{4}$

(e) 0

3. if f is continuous and $\int_1^3 f(2x+1)\,dx = 4$, then $\int_3^7 f(x)dx =$

(a) 4

(b) 8

(c) 10

(d) 6

(e) 2

4. The area of the region bounded by the line $y = \frac{1}{2}x$ and the parabola $y^2 = 8 - x$ is equal to

(a) 32

(b) 28

(c) 34

(d) 36

(e) 30

5. The length of the curve $y = \ln(\cos x)$, $0 \leq x \leq \dfrac{\pi}{4}$ is

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

(b) $\ln\left(1 - \sqrt{2}\right)$

(c) $\ln\left(1 + \sqrt{3}\right)$

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

(e) $\ln \dfrac{\sqrt{2}}{2}$

6. If $F(x) = \int_2^x \sqrt{3t^2 + 1}\, dt$, then $F'(2)F''(2) =$

(a) 12

(b) 4

(c) 3

(d) 6

(e) 0

7. $\int_0^1 x^3 e^x \, dx =$

(a) $6 + 3e$

(b) $6 - 4e$

(c) $6 + 2e$

(d) $6 - 2e$

(e) $6 - 3e$

8. The sequence $a_n = 3 \sin^{-1} \sqrt{\dfrac{3n-1}{4n+1}}$

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

(b) diverges

(c) converges to π

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

(e) converges to $\dfrac{\pi}{2}$

9. The series $\sum_{n=0}^{\infty} \frac{2^n 3^n}{n!}$ is

(a) convergent by ratio test and its sum is e^6

(b) divergent by the root test

(c) divergent by ratio test

(d) a series where the ratio test is inconclusive

(e) convergent by ratio test and its sum is 0

10. The smallest number of terms, needed in order to find the sum of the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^{4/3}}$ with $|\,error| < 0.0001$, is

(a) 100

(b) 400

(c) 10000

(d) 1000

(e) 10

11. $\displaystyle\int \frac{10}{(x-1)(x^2+9)}\,dx =$

(a) $\ln|x-1| - \frac{1}{3}\ln(x^2+9) + \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

(b) $\ln|x-1| - \frac{1}{2}\ln(x^2+9) - \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

(c) $\ln|x-1| + \frac{1}{2}\ln(x^2+9) + \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

(d) $\ln|x-1| + \frac{1}{3}\ln(x^2+9) - \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

(e) $\ln|x-1| - \frac{1}{3}\ln(x^2+9) - \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

12. The sum of the series $\displaystyle\sum_{n=0}^{\infty} \frac{2\,(-1)^n\,\pi^{2n}}{4^{2n}(2n)!}$ is equal to

(a) 2

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

(c) $\sqrt{2}$

(d) $\sqrt{3}$

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

13. The volume of the solid obtained by rotating the region enclosed by the curves $x = y^2$ and $y = x^3$ about the x-axis is equal to

(a) $\frac{3\pi}{7}$

(b) $\frac{3\pi}{14}$

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

(d) 2π

(e) $\frac{5\pi}{14}$

14. The interval of convergence of the series $\sum_{n=1}^{\infty} \frac{(x-1)^{2n}}{4^n}$ is

(a) $(-1, 3]$

(b) $(-\infty, \infty)$

(c) $(-1, 3)$

(d) $[-1, 3)$

(e) $[-1, 3]$

15. If $x > 3$, then $\int \frac{\sqrt{x^2-9}}{x^3}\, dx =$

(a) $\frac{1}{3}\sec^{-1}\left(\frac{x}{3}\right) - \frac{\sqrt{x^2-9}}{2x^2} + c$

(b) $\frac{1}{6}\sec^{-1}\left(\frac{x}{3}\right) - \frac{\sqrt{x^2-9}}{2x^2} + c$

(c) $\frac{1}{3}\sec^{-1}\left(\frac{x}{3}\right) + \frac{\sqrt{x^2-9}}{x^2} + c$

(d) $\frac{1}{6}\sec^{-1}\left(\frac{x}{2}\right) + \frac{\sqrt{x^2-9}}{2x} + c$

(e) $\frac{1}{6}\sec^{-1}\left(\frac{x}{3}\right) + \frac{\sqrt{x^2-9}}{2x} + c$

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

(a) converges by the integral test

(b) diverges by the ratio test

(c) diverges by the n_{th} − term test of divergence.

(d) converges by the ratio test

(e) diverges by the integral test

17. The area of the surface generated by revolving the curve of $y = \cos x, 0 \leq x \leq 1$, about the x-axis is give by

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

(b) $\int_0^1 2\pi \sin x \, \sqrt{1 + \cos^2 x} \, dx$

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

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

(e) $\int_0^1 2\pi \cos x \, \sqrt{1 + \sin x} \, dx$

18. The improper integral $\int_1^\infty \frac{\ln x}{x^2} \, dx$ is

(a) equal to 1

(b) equal to -1

(c) divergent

(d) equal to 2

(e) equal to 3

19. If the sequence defined by $a_1 = -4, a_{n+1} = \sqrt{8 + 2a_n}$ is convergent to L, then L=

(a) 6

(b) 2

(c) 4

(d) -2

(e) -4

20. The volume V of the solid generated by revolving around the y-axis the region in the first quadrant under the curve $y = 3x^2 - x^3$ from $x = 0$ to $x = 3$ is given by

(a) $V = \pi \int_0^3 (3x^2 - x^3)\, dx$

(b) $V = 2\pi \int_0^3 (3x^2 - x^3)\, dx$

(c) $V = \pi \int_0^3 (9x^4 - x^9)\, dx$

(d) $V = 2\pi \int_0^3 (3x^3 - x^4)\, dx$

(e) $V = 2\pi \int_0^3 (x^4 - 3x^2)\, dx$

21. The series $\sum_{n=2}^{\infty}(-1)^{n+1}\dfrac{1}{n\ln n}$ is

(a) absolutely convergent

(b) divergent

(c) conditionally convergent

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

(e) convergent and its sum is 0

22. $\displaystyle\int \frac{\sin x}{\cos^2 x - 16}\,dx =$

(a) $\dfrac{1}{16}\ln\left|\dfrac{4+\sin x}{\sin x - 4}\right| + c$

(b) $\dfrac{1}{8}\ln\left|\dfrac{4+\sin x}{\sin x - 4}\right| + c$

(c) $\dfrac{1}{4}\ln\left|\dfrac{4+\cos x}{\cos x - 2}\right| + c$

(d) $\dfrac{1}{4}\ln\left|\dfrac{4-\cos x}{\cos x + 4}\right| + c$

(e) $\dfrac{1}{8}\ln\left|\dfrac{4+\cos x}{\cos x - 4}\right| + c$

23. If $f(x) = \coth(\ln x)$, then $f'(2) =$

(a) $-\frac{8}{9}$

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

(c) $-\frac{16}{9}$

(d) $\frac{9}{16}$

(e) $\frac{16}{9}$

24. The first three nonzero terms of the Taylor series of $f(x) = \sin x$ about $a = \frac{\pi}{4}$ are given by

(a) $\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}\left(x - \frac{\pi}{4}\right) - \frac{\sqrt{2}}{4}\left(x - \frac{\pi}{4}\right)^2$

(b) $\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}\left(x - \frac{\pi}{4}\right) + \frac{\sqrt{2}}{2}\left(x - \frac{\pi}{4}\right)^2$

(c) $\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{4}\left(x - \frac{\pi}{4}\right) - \frac{\sqrt{2}}{8}\left(x - \frac{\pi}{4}\right)^2$

(d) $\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}\left(x - \frac{\pi}{4}\right) - \sqrt{2}\left(x - \frac{\pi}{4}\right)^2$

(e) $\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}\left(x - \frac{\pi}{4}\right) - \frac{\sqrt{2}}{4}\left(x - \frac{\pi}{4}\right)^2$

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

(a) Convergent geometric series

(b) Conditionally convergent

(c) Absolutely convergent

(d) Divergent by n_{th}term test of divergence

(e) Divergent by Comparison test

26. The Maclaurin series of the function $f(x) = \frac{x^2}{(x+1)^2}$ is given by

(a) $\sum_{n=0}^{\infty} (-1)^n n\, x^{n-1}, \ |x| < 1$

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

(c) $\sum_{n=0}^{\infty} (-1)^n n\, x^{n+3}, \ |x| < 1$

(d) $\sum_{n=1}^{\infty} (-1)^{n+1} n x^{n+1}, \ |x| < 1$

(e) $\sum_{n=0}^{\infty} (-1)^n x^{n+1}, \ |x| < 1$

27. If $ax + bx^2 + cx^3$ is the sum of the first three terms of the Maclaurin series of $e^{3x} \sin 2x$, then $6c - a - b =$

(a) 15

(b) 14

(c) 12

(d) 13

(e) 11

28. The series $\sum_{n=1}^{\infty} \frac{e^{n-1} - e^n}{e^{2n-1}}$ is

(a) convergent and its sum is 0

(b) convergent and its sum is 1

(c) convergent and its sum is -1

(d) convergent and its sum is e

(e) divergent

Name ....

ID .... Sec ....

1	a	b	c	d	e	f
2	a	b	c	d	e	f
3	a	b	c	d	e	f
4	a	b	c	d	e	f
5	a	b	c	d	e	f
6	a	b	c	d	e	f
7	a	b	c	d	e	f
8	a	b	c	d	e	f
9	a	b	c	d	e	f
10	a	b	c	d	e	f
11	a	b	c	d	e	f
12	a	b	c	d	e	f
13	a	b	c	d	e	f
14	a	b	c	d	e	f
15	a	b	c	d	e	f
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17	a	b	c	d	e	f
18	a	b	c	d	e	f
19	a	b	c	d	e	f
20	a	b	c	d	e	f
21	a	b	c	d	e	f
22	a	b	c	d	e	f
23	a	b	c	d	e	f
24	a	b	c	d	e	f
25	a	b	c	d	e	f
26	a	b	c	d	e	f
27	a	b	c	d	e	f
28	a	b	c	d	e	f
29	a	b	c	d	e	f
30	a	b	c	d	e	f
31	a	b	c	d	e	f
32	a	b	c	d	e	f
33	a	b	c	d	e	f
34	a	b	c	d	e	f
35	a	b	c	d	e	f

36	a	b	c	d	e	f
37	a	b	c	d	e	f
38	a	b	c	d	e	f
39	a	b	c	d	e	f
40	a	b	c	d	e	f
41	a	b	c	d	e	f
42	a	b	c	d	e	f
43	a	b	c	d	e	f
44	a	b	c	d	e	f
45	a	b	c	d	e	f
46	a	b	c	d	e	f
47	a	b	c	d	e	f
48	a	b	c	d	e	f
49	a	b	c	d	e	f
50	a	b	c	d	e	f
51	a	b	c	d	e	f
52	a	b	c	d	e	f
53	a	b	c	d	e	f
54	a	b	c	d	e	f
55	a	b	c	d	e	f
56	a	b	c	d	e	f
57	a	b	c	d	e	f
58	a	b	c	d	e	f
59	a	b	c	d	e	f
60	a	b	c	d	e	f
61	a	b	c	d	e	f
62	a	b	c	d	e	f
63	a	b	c	d	e	f
64	a	b	c	d	e	f
65	a	b	c	d	e	f
66	a	b	c	d	e	f
67	a	b	c	d	e	f
68	a	b	c	d	e	f
69	a	b	c	d	e	f
70	a	b	c	d	e	f

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

CODE 003 **Math 102** **CODE 003**

Final Exam

Term 133

Wednesday 13/08/2014

Net Time Allowed: 180 minutes

Name: ______________________________________

ID: ____________________ Sec: ____________________.

Check that this exam has 28 questions.

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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. The improper integral $\int_0^1 \frac{2}{(1-x)^3}\, dx$ is

(a) equal to 0

(b) divergent

(c) equal to 2

(d) equal to -1

(e) equal to -2

2. $\int_0^{\frac{\pi}{6}} \frac{\cos^2 x}{\sqrt{1+\cos 2x}}\, dx =$

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

(b) $\frac{\sqrt{2}}{4}$

(c) 0

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

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

3. The length of the curve $y = \ln(\cos x)$, $0 \leq x \leq \dfrac{\pi}{4}$ is

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

(b) $\ln\left(1-\sqrt{3}\right)$

(c) $\ln\left(1+\sqrt{3}\right)$

(d) $\ln \dfrac{\sqrt{2}}{2}$

(e) $\ln\left(1-\sqrt{2}\right)$

4. If $F(x) = \int_2^x \sqrt{3t^2+1}\,dt$, then $F'(2)F''(2) =$

(a) 12

(b) 0

(c) 6

(d) 3

(e) 4

5. The area of the region bounded by the line $y = \frac{1}{2}x$ and the parabola $y^2 = 8 - x$ is equal to

(a) 28

(b) 36

(c) 32

(d) 30

(e) 34

6. if f is continuous and $\int_1^3 f(2x+1)\,dx = 4$, then $\int_3^7 f(x)dx =$

(a) 10

(b) 4

(c) 6

(d) 8

(e) 2

7. The volume of the solid obtained by rotating the region enclosed by the curves $x = y^2$ and $y = x^3$ about the x-axis is equal to

(a) $\dfrac{3\pi}{7}$

(b) $\dfrac{5\pi}{14}$

(c) $\dfrac{3\pi}{14}$

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

(e) $2\,\pi$

8. $\displaystyle\int \frac{10}{(x-1)(x^2+9)}\,dx =$

(a) $\ln|x-1| + \dfrac{1}{2}\ln(x^2+9) + \dfrac{1}{3}\tan^{-1}\left(\dfrac{x}{3}\right) + c$

(b) $\ln|x-1| + \dfrac{1}{3}\ln(x^2+9) - \dfrac{1}{3}\tan^{-1}\left(\dfrac{x}{3}\right) + c$

(c) $\ln|x-1| - \dfrac{1}{2}\ln(x^2+9) - \dfrac{1}{3}\tan^{-1}\left(\dfrac{x}{3}\right) + c$

(d) $\ln|x-1| - \dfrac{1}{3}\ln(x^2+9) + \dfrac{1}{3}\tan^{-1}\left(\dfrac{x}{3}\right) + c$

(e) $\ln|x-1| - \dfrac{1}{3}\ln(x^2+9) - \dfrac{1}{3}\tan^{-1}\left(\dfrac{x}{3}\right) + c$

9. The sum of the series $\sum_{n=0}^{\infty} \frac{2\,(-1)^n\,\pi^{2n}}{4^{2n}(2n)!}$ is equal to

(a) $\sqrt{2}$

(b) 2

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

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

(e) $\sqrt{3}$

10. The smallest number of terms, needed in order to find the sum of the series
$\sum_{n=1}^{\infty} \frac{(-1)^n}{n^{4/3}}$ with $|\,error| < 0.0001$, is

(a) 100

(b) 10

(c) 10000

(d) 400

(e) 1000

11. The sequence $a_n = 3\sin^{-1}\sqrt{\dfrac{3n-1}{4n+1}}$

(a) diverges

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

(c) converges to π

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

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

12. The series $\displaystyle\sum_{n=0}^{\infty} \frac{2^n 3^n}{n!}$ is

(a) a series where the ratio test is inconclusive

(b) divergent by the root test

(c) convergent by ratio test and its sum is e^6

(d) convergent by ratio test and its sum is 0

(e) divergent by ratio test

13. $\int_0^1 x^3 e^x \, dx =$

(a) $6 + 3e$

(b) $6 + 2e$

(c) $6 - 2e$

(d) $6 - 3e$

(e) $6 - 4e$

14. The interval of convergence of the series $\sum_{n=1}^{\infty} \frac{(x-1)^{2n}}{4^n}$ is

(a) $(-1, 3]$

(b) $[-1, 3)$

(c) $(-1, 3)$

(d) $[-1, 3]$

(e) $(-\infty, \infty)$

15. $\displaystyle\int \frac{\sin x}{\cos^2 x - 16}\, dx =$

(a) $\dfrac{1}{8} \ln \left| \dfrac{4 + \sin x}{\sin x - 4} \right| + c$

(b) $\dfrac{1}{16} \ln \left| \dfrac{4 + \sin x}{\sin x - 4} \right| + c$

(c) $\dfrac{1}{8} \ln \left| \dfrac{4 + \cos x}{\cos x - 4} \right| + c$

(d) $\dfrac{1}{4} \ln \left| \dfrac{4 - \cos x}{\cos x + 4} \right| + c$

(e) $\dfrac{1}{4} \ln \left| \dfrac{4 + \cos x}{\cos x - 2} \right| + c$

16. If $x > 3$, then $\displaystyle\int \frac{\sqrt{x^2 - 9}}{x^3}\, dx =$

(a) $\dfrac{1}{6} \sec^{-1}\left(\dfrac{x}{3}\right) - \dfrac{\sqrt{x^2 - 9}}{2x^2} + c$

(b) $\dfrac{1}{6} \sec^{-1}\left(\dfrac{x}{2}\right) + \dfrac{\sqrt{x^2 - 9}}{2x} + c$

(c) $\dfrac{1}{3} \sec^{-1}\left(\dfrac{x}{3}\right) + \dfrac{\sqrt{x^2 - 9}}{x^2} + c$

(d) $\dfrac{1}{3} \sec^{-1}\left(\dfrac{x}{3}\right) - \dfrac{\sqrt{x^2 - 9}}{2x^2} + c$

(e) $\dfrac{1}{6} \sec^{-1}\left(\dfrac{x}{3}\right) + \dfrac{\sqrt{x^2 - 9}}{2x} + c$

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

(a) convergent and its sum is 0

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

(c) conditionally convergent

(d) divergent

(e) absolutely convergent

18. The area of the surface generated by revolving the curve of $y = \cos x, 0 \leq x \leq 1$, about the x-axis is give by

(a) $\int_0^1 2\pi \sin x \sqrt{1 + \cos^2 x}\, dx$

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

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

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

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

19. The volume V of the solid generated by revolving around the y-axis the region in the first quadrant under the curve $y = 3x^2 - x^3$ from $x = 0$ to $x = 3$ is given by

(a) $V = 2\pi \int_0^3 (3x^2 - x^3)\,dx$

(b) $V = 2\pi \int_0^3 (x^4 - 3x^2)\,dx$

(c) $V = \pi \int_0^3 (9x^4 - x^9)\,dx$

(d) $V = 2\pi \int_0^3 (3x^3 - x^4)\,dx$

(e) $V = \pi \int_0^3 (3x^2 - x^3)\,dx$

20. The improper integral $\int_1^\infty \frac{\ln x}{x^2}\,dx$ is

(a) equal to -1

(b) equal to 1

(c) equal to 3

(d) equal to 2

(e) divergent

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

(a) diverges by the n_{th} – term test of divergence.

(b) diverges by the ratio test

(c) converges by the integral test

(d) diverges by the integral test

(e) converges by the ratio test

22. If the sequence defined by $a_1 = -4, a_{n+1} = \sqrt{8 + 2a_n}$ is convergent to L, then $L=$

(a) -4

(b) -2

(c) 2

(d) 6

(e) 4

23. The first three nonzero terms of the Taylor series of $f(x) = \sin x$ about $a = \dfrac{\pi}{4}$ are given by

(a) $\dfrac{\sqrt{2}}{2} + \dfrac{\sqrt{2}}{2}\left(x - \dfrac{\pi}{4}\right) - \dfrac{\sqrt{2}}{4}\left(x - \dfrac{\pi}{4}\right)^2$

(b) $\dfrac{\sqrt{2}}{2} - \dfrac{\sqrt{2}}{2}\left(x - \dfrac{\pi}{4}\right) - \dfrac{\sqrt{2}}{4}\left(x - \dfrac{\pi}{4}\right)^2$

(c) $\dfrac{\sqrt{2}}{2} + \dfrac{\sqrt{2}}{2}\left(x - \dfrac{\pi}{4}\right) + \dfrac{\sqrt{2}}{2}\left(x - \dfrac{\pi}{4}\right)^2$

(d) $\dfrac{\sqrt{2}}{2} + \dfrac{\sqrt{2}}{2}\left(x - \dfrac{\pi}{4}\right) - \sqrt{2}\left(x - \dfrac{\pi}{4}\right)^2$

(e) $\dfrac{\sqrt{2}}{2} - \dfrac{\sqrt{2}}{4}\left(x - \dfrac{\pi}{4}\right) - \dfrac{\sqrt{2}}{8}\left(x - \dfrac{\pi}{4}\right)^2$

24. If $f(x) = \coth(\ln x)$, then $f'(2) =$

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

(b) $-\dfrac{8}{9}$

(c) $\dfrac{9}{16}$

(d) $-\dfrac{16}{9}$

(e) $\dfrac{16}{9}$

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

(a) Convergent geometric series

(b) Divergent by Comparison test

(c) Absolutely convergent

(d) Divergent by n_{th}term test of divergence

(e) Conditionally convergent

26. The Maclaurin series of the function $f(x) = \frac{x^2}{(x+1)^2}$ is given by

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

(b) $\sum_{n=1}^{\infty} (-1)^{n+1} n x^{n+1}, \ |x| < 1$

(c) $\sum_{n=0}^{\infty} (-1)^n n \, x^{n-1}, \ |x| < 1$

(d) $\sum_{n=0}^{\infty} (-1)^n x^{n+2}, \ |x| < 1$

(e) $\sum_{n=0}^{\infty} (-1)^n n \, x^{n+3}, \ |x| < 1$

27. The series $\sum_{n=1}^{\infty} \frac{e^{n-1} - e^{n}}{e^{2n-1}}$ is

(a) convergent and its sum is e

(b) convergent and its sum is 1

(c) convergent and its sum is 0

(d) divergent

(e) convergent and its sum is -1

28. If $ax + bx^2 + cx^3$ is the sum of the first three terms of the Maclaurin series of $e^{3x} \sin 2x$, then $6c - a - b =$

(a) 14

(b) 12

(c) 13

(d) 15

(e) 11

Name ....

ID .... Sec ....

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67	a	b	c	d	e	f
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69	a	b	c	d	e	f
70	a	b	c	d	e	f

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

CODE 004 **Math 102** **CODE 004**

Final Exam

Term 133

Wednesday 13/08/2014

Net Time Allowed: 180 minutes

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.
2. Use HB 2.5 pencils only.
3. Use a good eraser. DO NOT use the erasers attached to the pencil.
4. Write your name, ID number and Section number on the examination paper and in the upper left corner of the answer sheet.
5. When bubbling your ID number and Section number, be sure that the bubbles match with the numbers that you write.
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. The area of the region bounded by the line $y = \frac{1}{2}x$ and the parabola $y^2 = 8 - x$ is equal to

(a) 34

(b) 36

(c) 32

(d) 30

(e) 28

2. If $F(x) = \int_2^x \sqrt{3t^2 + 1}\, dt$, then $F'(2)F''(2) =$

(a) 6

(b) 3

(c) 4

(d) 0

(e) 12

3. $\displaystyle\int_0^{\frac{\pi}{6}} \frac{\cos^2 x}{\sqrt{1+\cos 2x}}\, dx =$

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

(b) $\dfrac{\sqrt{3}}{4}$

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

(d) 0

(e) $\dfrac{\sqrt{2}}{4}$

4. The length of the curve $y = \ln(\cos x)$, $0 \le x \le \dfrac{\pi}{4}$ is

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

(b) $\ln\left(1-\sqrt{2}\right)$

(c) $\ln\left(1+\sqrt{3}\right)$

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

(e) $\ln\dfrac{\sqrt{2}}{2}$

5. The improper integral $\int_0^1 \frac{2}{(1-x)^3}\,dx$ is

(a) equal to 2

(b) equal to -2

(c) divergent

(d) equal to -1

(e) equal to 0

6. if f is continuous and $\int_1^3 f(2x+1)\,dx = 4$, then $\int_3^7 f(x)dx =$

(a) 10

(b) 8

(c) 6

(d) 2

(e) 4

7. $\int_0^1 x^3 e^x \, dx =$

(a) $6 - 3e$

(b) $6 + 3e$

(c) $6 - 2e$

(d) $6 - 4e$

(e) $6 + 2e$

8. The volume of the solid obtained by rotating the region enclosed by the curves $x = y^2$ and $y = x^3$ about the x-axis is equal to

(a) $\frac{3\pi}{7}$

(b) $\frac{3\pi}{14}$

(c) $\frac{5\pi}{14}$

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

(e) $2\,\pi$

9. The sequence $a_n = 3\sin^{-1}\sqrt{\dfrac{3n-1}{4n+1}}$

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

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

(c) diverges

(d) converges to π

(e) converges to $\dfrac{\pi}{2}$

10. The smallest number of terms, needed in order to find the sum of the series $\sum_{n=1}^{\infty} \dfrac{(-1)^n}{n^{4/3}}$ with $|\,error| < 0.0001$, is

(a) 400

(b) 100

(c) 1000

(d) 10000

(e) 10

11. The interval of convergence of the series $\sum_{n=1}^{\infty} \frac{(x-1)^{2n}}{4^n}$ is

(a) $[-1, 3)$

(b) $(-\infty, \infty)$

(c) $[-1, 3]$

(d) $(-1, 3)$

(e) $(-1, 3]$

12. The series $\sum_{n=0}^{\infty} \frac{2^n 3^n}{n!}$ is

(a) convergent by ratio test and its sum is 0

(b) a series where the ratio test is inconclusive

(c) divergent by ratio test

(d) convergent by ratio test and its sum is e^6

(e) divergent by the root test

13. The sum of the series $\sum_{n=0}^{\infty} \frac{2\,(-1)^n\,\pi^{2n}}{4^{2n}(2n)!}$ is equal to

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

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

(c) $\sqrt{2}$

(d) 2

(e) $\sqrt{3}$

14. $\int \frac{10}{(x-1)(x^2+9)}\,dx =$

(a) $\ln|x-1| - \frac{1}{2}\ln(x^2+9) - \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

(b) $\ln|x-1| - \frac{1}{3}\ln(x^2+9) + \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

(c) $\ln|x-1| - \frac{1}{3}\ln(x^2+9) - \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

(d) $\ln|x-1| + \frac{1}{3}\ln(x^2+9) - \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

(e) $\ln|x-1| + \frac{1}{2}\ln(x^2+9) + \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + c$

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

(a) diverges by the integral test

(b) diverges by the n_{th} – term test of divergence.

(c) converges by the ratio test

(d) diverges by the ratio test

(e) converges by the integral test

16. If the sequence defined by $a_1 = -4, a_{n+1} = \sqrt{8+2a_n}$ is convergent to L, then $L=$

(a) 2

(b) -4

(c) 6

(d) 4

(e) -2

17. The area of the surface generated by revolving the curve of $y = \cos x, 0 \le x \le 1$, about the x-axis is give by

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

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

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

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

(e) $\int_0^1 2\pi \cos x \sqrt{1 + \sin^2 x}\, dx$

18. If $x > 3$, then $\int \frac{\sqrt{x^2 - 9}}{x^3}\, dx =$

(a) $\frac{1}{3} \sec^{-1}\left(\frac{x}{3}\right) + \frac{\sqrt{x^2 - 9}}{x^2} + c$

(b) $\frac{1}{6} \sec^{-1}\left(\frac{x}{3}\right) - \frac{\sqrt{x^2 - 9}}{2x^2} + c$

(c) $\frac{1}{3} \sec^{-1}\left(\frac{x}{3}\right) - \frac{\sqrt{x^2 - 9}}{2x^2} + c$

(d) $\frac{1}{6} \sec^{-1}\left(\frac{x}{3}\right) + \frac{\sqrt{x^2 - 9}}{2x} + c$

(e) $\frac{1}{6} \sec^{-1}\left(\frac{x}{2}\right) + \frac{\sqrt{x^2 - 9}}{2x} + c$

19. The volume V of the solid generated by revolving around the y-axis the region in the first quadrant under the curve $y = 3x^2 - x^3$ from $x = 0$ to $x = 3$ is given by

(a) $V = 2\pi \int_0^3 (x^4 - 3x^2)\, dx$

(b) $V = \pi \int_0^3 (3x^2 - x^3)\, dx$

(c) $V = \pi \int_0^3 (9x^4 - x^9)\, dx$

(d) $V = 2\pi \int_0^3 (3x^3 - x^4)\, dx$

(e) $V = 2\pi \int_0^3 (3x^2 - x^3)\, dx$

20. $\int \frac{\sin x}{\cos^2 x - 16}\, dx =$

(a) $\frac{1}{4} \ln \left| \frac{4 - \cos x}{\cos x + 4} \right| + c$

(b) $\frac{1}{8} \ln \left| \frac{4 + \cos x}{\cos x - 4} \right| + c$

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

(d) $\frac{1}{16} \ln \left| \frac{4 + \sin x}{\sin x - 4} \right| + c$

(e) $\frac{1}{8} \ln \left| \frac{4 + \sin x}{\sin x - 4} \right| + c$

21. The improper integral $\int_1^{\infty} \frac{\ln x}{x^2}\, dx$ is

(a) divergent

(b) equal to -1

(c) equal to 1

(d) equal to 3

(e) equal to 2

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

(a) absolutely convergent

(b) divergent

(c) convergent and its sum is 0

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

(e) conditionally convergent

23. The first three nonzero terms of the Taylor series of $f(x) = \sin x$ about $a = \dfrac{\pi}{4}$ are given by

(a) $\dfrac{\sqrt{2}}{2} + \dfrac{\sqrt{2}}{2}\left(x - \dfrac{\pi}{4}\right) - \dfrac{\sqrt{2}}{4}\left(x - \dfrac{\pi}{4}\right)^2$

(b) $\dfrac{\sqrt{2}}{2} - \dfrac{\sqrt{2}}{4}\left(x - \dfrac{\pi}{4}\right) - \dfrac{\sqrt{2}}{8}\left(x - \dfrac{\pi}{4}\right)^2$

(c) $\dfrac{\sqrt{2}}{2} - \dfrac{\sqrt{2}}{2}\left(x - \dfrac{\pi}{4}\right) - \dfrac{\sqrt{2}}{4}\left(x - \dfrac{\pi}{4}\right)^2$

(d) $\dfrac{\sqrt{2}}{2} + \dfrac{\sqrt{2}}{2}\left(x - \dfrac{\pi}{4}\right) - \sqrt{2}\left(x - \dfrac{\pi}{4}\right)^2$

(e) $\dfrac{\sqrt{2}}{2} + \dfrac{\sqrt{2}}{2}\left(x - \dfrac{\pi}{4}\right) + \dfrac{\sqrt{2}}{2}\left(x - \dfrac{\pi}{4}\right)^2$

24. The series $\displaystyle\sum_{n=1}^{\infty} \frac{e^{n-1} - e^{n}}{e^{2n-1}}$ is

(a) divergent

(b) convergent and its sum is 1

(c) convergent and its sum is -1

(d) convergent and its sum is e

(e) convergent and its sum is 0

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

(a) Conditionally convergent

(b) Divergent by n_{th}term test of divergence

(c) Convergent geometric series

(d) Absolutely convergent

(e) Divergent by Comparison test

26. If $ax + bx^2 + cx^3$ is the sum of the first three terms of the Maclaurin series of $e^{3x} \sin 2x$, then $6c - a - b =$

(a) 14

(b) 15

(c) 11

(d) 13

(e) 12

27. If $f(x) = \coth(\ln x)$, then $f'(2) =$

(a) $\dfrac{16}{9}$

(b) $\dfrac{4}{3}$

(c) $-\dfrac{8}{9}$

(d) $\dfrac{9}{16}$

(e) $-\dfrac{16}{9}$

28. The Maclaurin series of the function $f(x) = \dfrac{x^2}{(x+1)^2}$ is given by

(a) $\sum_{n=0}^{\infty} (-1)^n n\, x^{n-1}, \ |x| < 1$

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

(c) $\sum_{n=0}^{\infty} (-1)^n x^{n+1}, \ |x| < 1$

(d) $\sum_{n=1}^{\infty} (-1)^{n+1} n x^{n+1}, \ |x| < 1$

(e) $\sum_{n=0}^{\infty} (-1)^n n\, x^{n+3}, \ |x| < 1$

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Q	MM	V1	V2	V3	V4
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3	a	d	b	a	e
4	a	b	d	c	d
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20	a	d	d	b	b
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23	a	a	a	a	a
24	a	a	a	b	c
25	a	c	c	c	d
26	a	b	d	b	c
27	a	e	e	e	c
28	a	b	c	e	d

Answer Counts

V	a	b	c	d	e
1	5	7	7	5	4
2	3	6	5	9	5
3	7	6	4	7	4
4	4	9	4	7	4