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

Math 102 - Semester 063

Final Exam (3 Hours) **23/8/2007**

Name: **ID #:** **Section:**

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	a	**b**	**c**	**d**	**e**
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1. $\displaystyle\int_0^{\pi/2} \cos^5(x)dx =$

   (a) $\dfrac{15}{8}$

   (b) 3

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

   (d) $-\dfrac{8}{15}$

   (e) 0

2. $\displaystyle\int_0^{\frac{\pi}{4}} \tan^3(x)\sec^4(x)dx =$

   (a) 5

   (b) $\dfrac{5}{12}$

   (c) 12

   (d) $\dfrac{12}{5}$

   (e) $-\dfrac{12}{5}$

3. $\displaystyle\int \frac{1}{x^2\sqrt{16-x^2}}\,dx =$

   (a) $\dfrac{-\sqrt{16-x^2}}{16x}+C$

   (b) $\dfrac{\sqrt{16-x^2}}{16x}+C$

   (c) $\dfrac{-\sqrt{16-x^2}}{x}+C$

   (d) $\dfrac{-\sqrt{16-x^2}}{16}+C$

   (e) $\dfrac{-\sqrt{16-x^2}}{16x^2}+C$

4. Using partial fraction, $\dfrac{1}{x(x^2+1)^2}$ equals

(a) $\dfrac{1}{x} + \dfrac{x}{x^2+1} + \dfrac{x}{(x^2+1)^2}$

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

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

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

(e) $\dfrac{1}{x} + \dfrac{x}{x^2+1} - \dfrac{x}{(x^2+1)^2}$

5. Let R be the region between the graphs of $f(x) = 5x$ and $g(x) = x^2$ on $[0, 3]$. If R is revolved about the x-axis then the volume of the solid obtained equals

(a) $\dfrac{5}{882\pi}$

(b) $\dfrac{5\pi}{882}$

(c) $\dfrac{882}{5}$

(d) 882π

(e) $\dfrac{882\pi}{5}$

6. The length L of the graph of $f(x) = \ln x - \dfrac{1}{8}x^2$ for $1 \leq x \leq e$ is equal to

(a) $1 + \dfrac{e^2-1}{8}$

(b) $\dfrac{e^2-1}{8}$

(c) $\pi + \dfrac{e^2-1}{8}$

(d) $1 - \dfrac{e^2+1}{8}$

(e) $\pi + \dfrac{e^2+1}{8}$

7. If the curve of $f(x) = \sqrt{1 - x^2}$ for $0 \leq x \leq \frac{1}{2}$ revolves about the x-axis then the area of the surface of revolution is equal to

   (a) 2π
   (b) $\frac{\pi}{2}$
   (c) π
   (d) $\frac{\pi}{4}$
   (e) $\frac{\pi}{8}$

8. $\int_1^{\sqrt{2}} x^5\sqrt{x^2 - 1}\, dx$ equals

   (a) $\frac{92\pi}{105}$
   (b) $\frac{105}{92}$
   (c) $\frac{92}{105}$
   (d) $\frac{105}{2\pi}$
   (e) $\frac{105}{92\pi}$

9. $\int_0^1 x^2 e^{-x} dx =$

   (a) $-5e + 2$
   (b) $5e^{-1} + 2$
   (c) $-5e^{-1} + 2$
   (d) $-5e^{-1} - 2$
   (e) $-5e - 2$

10. $\displaystyle\int_{-\infty}^{\infty} \frac{1}{x^2+1} dx =$

(a) $\frac{\pi}{4}$
(b) diverges
(c) 0
(d) $\frac{\pi}{2}$
(e) π

11. The average value of $f(x) = \sin^2(x)$ over $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$ is equal to

(a) $-\frac{\pi}{4}$
(b) $\frac{\pi}{4}$
(c) $-\frac{1}{2}$
(d) $\frac{\pi - 2}{2\pi}$
(e) $\frac{\pi + 2}{2\pi}$

12. The area enclosed by the line $y = x - 1$ and the parabola $y^2 = 2x + 6$ is equal to

(a) 9
(b) 18
(c) $\frac{9}{2}$
(d) 27
(e) $\frac{27}{2}$

13. If $\int_2^3 f(x)dx = 3\int_1^2 f(x)dx$, $\int_1^2 f(x)dx + \int_3^4 f(x)dx = \int_2^3 f(x)dx$, $\int_1^5 f(x)dx = 17$ and $\int_2^3 f(x)dx = 4$, then $\int_4^5 f(x)dx$ equals

(a) 9
(b) 3
(c) 4
(d) -9
(e) -3

14. The sequence $\left\{(-1)^n \frac{3n^2+5}{n^3-n^2+1}\right\}_{n=1}^{\infty}$:

(a) converges to 0
(b) converges to -1
(c) converges to 1
(d) converges to 3
(e) diverges

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

(a) converges to 1
(b) converges to 2
(c) converges to e
(d) converges to $\frac{1}{e}$
(e) diverges

16. $\displaystyle\sum_{n=1}^{\infty} \frac{2}{n^2+n} =$

(a) 0
(b) 1
(c) 2
(d) 3
(e) ∞

17. $\displaystyle\sum_{n=1}^{\infty} \left(\ln(n) - \frac{1}{n}\right) =$

(a) $-\infty$
(b) 0
(c) 1
(d) 2
(e) ∞

18. $\displaystyle\sum_{n=4}^{\infty} \left(\frac{-1}{e}\right)^{n-1} =$

(a) $\dfrac{1}{e}$
(b) $\dfrac{e}{1+e}$
(c) $\dfrac{1}{e(e-1)}$
(d) $\dfrac{-1}{e^2(e+1)}$
(e) The series diverges

19. The series $\displaystyle\sum_{n=1}^{\infty} \frac{-\ln(n)}{n^2+3}$:

(a) converges absolutely
(b) converges conditionally
(c) converges to 3
(d) converges to e
(e) diverges

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

(a) converges absolutely
(b) converges to -1
(c) converges to 3
(d) converges to 2
(e) converges conditionally

21. The series $\displaystyle\sum_{n=2}^{\infty} \frac{(-2)^n}{n!}$:

(a) converges to $\dfrac{1+e^2}{e^2}$
(b) converges to $\dfrac{e^2}{e^2+1}$
(c) converges to $\dfrac{e^2-1}{e^2}$
(d) converges to $\dfrac{e^2}{e^2-1}$
(e) diverges

22. The interval of convergence of the power series $\sum_{n=2}^{\infty} \frac{x^{n+1}}{2n+1}$ is

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

23. An approximation of $\frac{1}{e}$ that is accurate to 6 decimal places is:

(a) $\frac{1}{2!} - \frac{1}{3!} + \frac{1}{4!} - \frac{1}{5!}$
(b) $-\frac{1}{2!} + \frac{1}{3!} - \frac{1}{4!} + \frac{1}{5!} - \frac{1}{6!} + \frac{1}{7!}$
(c) $\frac{1}{2!} - \frac{1}{3!} + \frac{1}{4!} - \frac{1}{5!} + \frac{1}{6!} - \frac{1}{7!}$
(d) $-\frac{1}{2!} + \frac{1}{3!} - \frac{1}{4!} + \frac{1}{5!} - \frac{1}{6!} + \frac{1}{7!} - \frac{1}{8!} + \frac{1}{9!}$
(e) $\frac{1}{2!} - \frac{1}{3!} + \frac{1}{4!} - \frac{1}{5!} + \frac{1}{6!} - \frac{1}{7!} + \frac{1}{8!} - \frac{1}{9!}$

24. $\frac{x}{1+2x} =$

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

25. The series $\sum_{n=3}^{\infty}(-1)^n \left(\frac{n^3+2n-1}{3n^3+3n^2-6}\right)^n$:

(a) converges absolutely

(b) converges conditionally

(c) diverges

(d) $= \infty$

(e) $= -\infty$