

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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1. $\int_0^{\pi/2} \cos^5(x) dx =$

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

(b) 3

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

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

(e) 0

2. $\int \tan^3(x) \sec^4(x) dx =$

(a) 5

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

(c) 12

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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) $\frac{5}{882\pi}$

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

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

(d) 882π

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

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

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

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

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

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

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

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

- (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

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

- (a) 0
- (b) 1
- (c) 2
- (d) 3
- (e) ∞

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

- (a) $-\infty$
- (b) 0
- (c) 1
- (d) 2
- (e) ∞

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

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

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

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

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

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

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

- (a) converges to $\frac{1 + e^2}{e^2}$
- (b) converges to $\frac{e^2}{e^2 + 1}$
- (c) converges to $\frac{e^2 - 1}{e^2}$
- (d) converges to $\frac{e^2}{e^2 - 1}$
- (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) $= -\infty$