Faculty of Engineering
Damietta University
Department of Engineering Mathematics, Physics & Science

الأسم:
الفصل:

Course Title: Mathematics 2	Course Code: MPH 102	Spec.: Preparatory Year
Examiner: Dr. Moataz El-Zekey	M_A	Total Marks: 30
Date: 7 / 4/ 2019	Mid-term Exam (2019)	Time: 1.5 Hours

Answer the following multiple choice questions by circling the correct response.

1. The improper integral $\int_{-\infty}^{\infty} x\,dx$ is

A. convergent since the area to the left of $x = 0$ cancels with the area to the right of $x = 0$.

B. convergent since it equals $\lim_{t\to-\infty}\int_t^0 x\,dx + \lim_{s\to\infty}\int_0^s x\,dx = -\infty + \infty = 0$.

C. divergent by comparison to $\int_{-\infty}^{\infty} xe^{-x}\,dx$.

(D.) divergent since both integrals $\int_0^{\infty} x\,dx$ and $\int_{-\infty}^{0} x\,dx$ are divergent.

2. Let f be a differentiable function such that

$$\int f(x)\sin x\,dx = -f(x)\cos x + \int 4x^3\cos x\,dx$$

which of the following could be $f(x)$?

A. $\cos x$ **B.** $\sin x$ **(C.)** x^4 **D.** $-x^4$ **E.** $4x^3$

3. $\int_0^{\pi}\sin^8 x\,dx =$ (Hint: Don't try to evaluate the integral; instead eliminate the tree wrong answers)

A. π **B.** $\frac{3\pi}{90} - 1$ **(C.)** $\frac{35\pi}{128}$ **D.** $\frac{\pi}{2}$

4. Let f be a function such that $\int_6^{12} f(2x)\,dx = 10$, which of the following must be true?

A. $\int_{12}^{24} f(x)\,dx = 5$ **(B.)** $\int_{12}^{24} f(x)\,dx = 20$ **C.** $\int_6^{12} f(x)\,dx = 5$ **D.** $\int_6^{12} f(x)\,dx = 20$

5. An antiderivative of $y = e^{x+e^x}$ is

A. $\frac{e^{x+e^x}}{1+e^x}$ **B.** $(1+e^x)e^{x+e^x}$ **C.** e^{x+e^x} **D.** e^{1+e^x} **(E.)** e^{e^x}

6. Assume $f(x)$ is a function with continuous derivatives, and $f(7) = 10$; $f(2) = 5$; and $f'(7) = 3$. What is

$$\int_2^7 (2x-4)f''(x)dx$$

A. 25 **B.** 10 **(C.)** 20 **D.** 0 **E.** Can't be determined without knowing $f'(2)$.

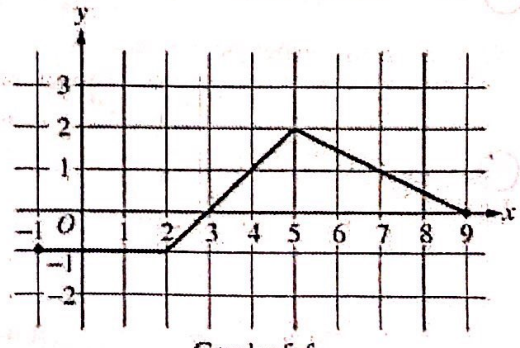
7. If $f(x) = \int_2^{\sin x}\sqrt{1+t^2}\,dt$, then $\frac{df}{dx} =$

A. $(\cos x)\sqrt{1+\sin x}$ **B.** $\sqrt{1+\sin^2 x}$ **(C.)** $(\cos x)\sqrt{1+\sin^2 x}$ **D.** $(\cos x)(1+\sin^2 x)^{3/2}$

8. The graph of the function f is shown below. What is the value of the following integral?

$$\int_{-1}^{9}(3f(x)+2)dx =$$

A. 7.5
B. 9.5
(C.) 27.5
D. 47
E. 48.5



Graph of f

9. For what values of p does the integral $\int_1^\infty 1/x^p dx$ converge?

A. $p < 1$ B. $p \geq 1$ (C) $p > 1$ D. None of these

10. Which of the following is not an improper?

A. $\int_0^1 \ln x \, dx$ (B) $\int_{-1}^1 \frac{dx}{x^2+1}$ C. $\int_2^5 \frac{dx}{\sqrt{x^2-4}}$ D. None of these

11. $\int \frac{1}{x^2+x} dx =$

A. $\ln|x^2+1| + C$ B. $\ln\left|\frac{x+1}{x}\right| + C$ (C) $\ln\left|\frac{x}{x+1}\right| + C$ D. None of these.

12. The substitution of $x = \sin\theta$ in the following integral results in

$$\int_0^{1/2} \frac{x^2}{\sqrt{1-x^2}} =$$

A. $\int_0^{1/2} \frac{\sin^2\theta}{\cos\theta} d\theta$ B. $\int_0^{1/2} \sin^2\theta \, d\theta$ (C) $\int_0^{\pi/6} \sin^2\theta \, d\theta$ D. $\int_0^{\pi/3} \sin^2\theta \, d\theta$

13. Using a trigonometric substitution, the following integral

$$\int \frac{x^2}{\sqrt{x^2+25}} =$$

(A) $25\int \tan^2\theta \sec\theta \, d\theta$ B. $5\int \tan^2\theta \sec\theta \, d\theta$
C. $25\int (\tan^2\theta / \sec\theta) \, d\theta$ D. $5\int (\tan^2\theta / \sec\theta) \, d\theta$

14. What is the form of the complete partial fractions decomposition of this function:

$$\frac{2x+1}{(x^2+4)^2(x-1)^2(x-3)}$$

A. $\frac{A}{x^2+4} + \frac{B}{(x^2+4)^2} + \frac{C}{x-1} + \frac{D}{(x-1)^2} + \frac{F}{x-3}$

(B) $\frac{Ax+B}{x^2+4} + \frac{Cx+D}{(x^2+4)^2} + \frac{E}{x-1} + \frac{F}{(x-1)^2} + \frac{G}{x-3}$

C. $\frac{Ax+B}{x^2+4} + \frac{Cx+D}{(x^2+4)^2} + \frac{Ex+F}{(x-1)^2} + \frac{G}{x-3}$

D. $\frac{Ax+B}{(x^2+4)^2} + \frac{Cx+D}{(x-1)^2} + \frac{F}{x-3}$

15. $\int \tan^{-1}(2x) \, dx =$

A. $x\tan^{-1}(2x) + C$ B. $x\tan^{-1}(2x) + \frac{1}{4}\ln(1+4x^2) + C$

(C) $x\tan^{-1}(2x) - \frac{1}{4}\ln(1+4x^2) + C$ D. None of these

16. What can be said about the integrals

$$(i) \int_0^1 \frac{1}{x^2} dx \qquad (ii) \int_1^\infty \frac{\sin^2 x}{x^2} dx$$

(A) (i) diverges and (ii) converges B. Both (i) and (ii) convege
C. (i) converges and (ii) diverges D. Both (i) and (ii) diverge.

GOOD LUCK!

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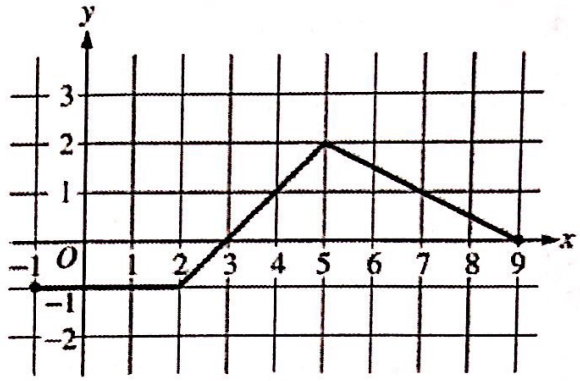

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GOOD LUCK!