Math 1226 **Common Final Exam** **Fall 2016**

Form A

Instructions: Follow all of the instructions below carefully:

- Darken the appropriate circle for your test form (A, B or C) in the "Test Version" section in the upper right of the opscan form.
- Enter your name under "Student Name."
- Enter your Student ID number under "ID Number" and darken the appropriate circles.
- Enter your CRN under "Class ID" and darken the appropriate circles.
- Write your test form (A, B, or C) under "Test ID."

Mark your answers to the test questions in rows 1 – 14 of the op scan sheet. **Use a number 2 pencil**. Machine grading may ignore faintly marked circles. Your score on this test will be the number of correct answers. You have one hour to complete this portion of the exam. Turn in the op scan sheet with your answers, this exam and all scrap paper at the end of this part of the final exam.

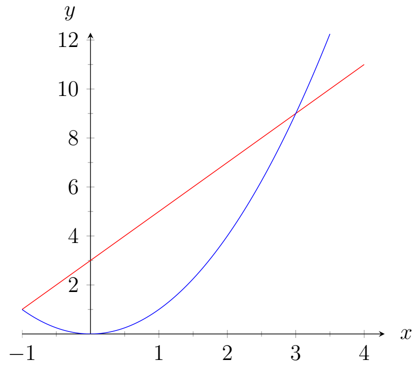
Exam Policies: You may not use a book, notes, formula sheet, or a calculator or computer. Giving or receiving unauthorized aid is an Honor Code Violation.

Signature: ______________________________

Name (printed): ______________________________

Student ID #: ______________________________

1. Two students were asked to determine the area bounded by the curves $y = x^2$ and $y = 2x + 3$. Which student is correct?



$$\text{Student I: } A = \int_{-1}^{3} \left[(2x+3) - x^2\right] dx$$

$$\text{Student II: } A = \int_{0}^{9} \left[\sqrt{y} - \left(\frac{1}{2}(y-3)\right)\right] dy$$

(A) Only Student I is correct.

(B) Only Student II is correct.

(C) Both Student I and Student II are correct.

(D) Neither student is correct.

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2. Which of the following is equivalent to $\displaystyle\int x^2 \ln(x)\, dx$?

(A) $x^2 \ln(x) - \displaystyle\int 2\, dx$

(B) $x^2 \ln(x) - \displaystyle\int \frac{1}{3}x^2\, dx$

(C) $\dfrac{1}{3}x^3 \ln(x) - \displaystyle\int \frac{1}{3}x^2\, dx$

(D) $\dfrac{1}{3}x^3 \ln(x) - \displaystyle\int 2\, dx$

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3. Which integral is obtained after applying an appropriate trigonometric substitution to

$$\int \frac{1}{\sqrt{25x^2 - 4}}\, dx\ ?$$

(A) $\dfrac{1}{5}\displaystyle\int d\theta$

(B) $\dfrac{1}{5}\displaystyle\int \sec(\theta)\, d\theta$

(C) $\dfrac{1}{2}\displaystyle\int \sec(\theta)\, d\theta$

(D) $\dfrac{1}{2}\displaystyle\int \frac{1}{\tan(\theta)}\, d\theta$

4. Which value of k will make $f(x)$, shown below, a probability density function?

$$f(x) = \begin{cases} k\,(2-x) & , \quad 0 < x < 6 \\ 0 & , \quad \text{otherwise} \end{cases}$$

(A) No such value of k exists since it is impossible to find a k so that $\displaystyle\int_{-\infty}^{\infty} f(x)\,dx = 1$.

(B) No such value of k exists since it is impossible to find a k so that $f(x)$ is greater than or equal to zero everywhere.

(C) No such value of k exists since k must be positive.

(D) k must be equal to $-\dfrac{1}{6}$.

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5. Set up the integral to determine the volume obtained by revolving the region bounded by the x-axis, $y = \sin x$, $x = 0$, and $x = \pi$ about the line $x = -\dfrac{\pi}{2}$.

(A) $V = \displaystyle\int_0^{\pi} 2\pi\,(\sin x)\left(x + \frac{\pi}{2}\right) dx$

(B) $V = \displaystyle\int_0^{1} \pi\left(\sin^{-1} y - \frac{\pi}{2}\right)^2 dy$

(C) $V = \displaystyle\int_0^{\pi} 2\pi\,(\sin x)\left(-\frac{\pi}{2} - x\right) dx$

(D) $V = \displaystyle\int_0^{1} 2\pi\,(\sin x)\left(x + \frac{\pi}{2}\right) dx$

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6. A student was asked to evaluate two limits and gave the following answers:

$$I : \lim_{x\to 1} \frac{x-1}{x^2} = \frac{1}{2} \qquad\qquad II : \lim_{x\to\infty} \left(1 + \frac{2}{x}\right)^x = 1$$

Which of the following is TRUE?

(A) Only evaluation I is correct.

(B) Only evaluation II is correct.

(C) Both evaluations are correct.

(D) Neither evaluation is correct.

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7. Evaluate $\displaystyle\int_0^\infty 2xe^{-x^2}\,dx$.

(A) 0

(B) 1

(C) e^1

(D) The integral diverges.

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8. The following parametric curve has a horizontal tangent at $t = 2$. Determine the value of a.

$$x(t) = \frac{a}{2}t^2 + t, \qquad y(t) = 2t^3 - at,$$

(A) -1

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

(C) 8

(D) 24

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9. Find the coefficient of the $\ln|x^2+1|$ term in the evaluation of $\displaystyle\int \frac{5}{x^3+x}\,dx$.

(A) 5

(B) $-\dfrac{5}{2}$

(C) -1

(D) There is no such term in the evaluation of $\displaystyle\int \frac{5}{x^3+x}\,dx$.

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10. Which of the following polar coordinates is equivalent to the Cartesian coordinates $(x, y) = (-1, 1)$?

(A) $(r,\theta) = \left(1, \dfrac{3\pi}{4}\right)$

(B) $(r,\theta) = \left(1, \dfrac{2\pi}{3}\right)$

(C) $(r,\theta) = \left(\sqrt{2}, \dfrac{3\pi}{4}\right)$

(D) $(r,\theta) = \left(\sqrt{2}, \dfrac{2\pi}{3}\right)$

11. Consider the series $\sum_{n=1}^{\infty} a_n$ with nth partial sum $s_n = \sum_{i=1}^{n} a_i = \cos\left(\frac{7}{n}\right)$. If possible, find the limit of the sequence $\{a_n\}$.

(A) 0

(B) 1

(C) The limit does not exist.

(D) There is not enough information to determine the limit.

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12. The series $\sum_{n=0}^{\infty} \frac{5n+6}{\sqrt{2n^3+4}}$

(A) Diverges by the Divergence Test.

(B) Diverges by the Limit Comparison Test.

(C) Converges by the Ratio Test.

(D) Converges by the Comparison Test.

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13. Let $T_3(x) = c_0 + c_1(x-1) + c_2(x-1)^2 + c_3(x-1)^3$ be a third degree Taylor polynomial for $f(x) = x^4 + x^3 + x^2$. Find c_3.

(A) -3

(B) 1

(C) 5

(D) 10

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14. Find the first three nonzero terms of the Maclaurin series for

$$f(x) = \frac{e^x - e^{-x}}{2}$$

You may use $e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!} = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \cdots$

(A) $x + \frac{x^3}{3!} + \frac{x^5}{5!}$

(B) $1 + \frac{x^2}{2!} + \frac{x^4}{4!}$

(C) $\frac{x}{3!} + \frac{x^3}{5!} + \frac{x^5}{7!}$

(D) $2 + x^2 + \frac{x^4}{2}$