

Form A

Math 1206 Common Part of Final Exam December 14, 2001

INSTRUCTIONS: Please enter your NAME, ID NUMBER, FORM designation, and CRN on your op scan sheet. The CRN should be written in the upper right-hand box labeled "Course." **Do not include the course number.** In the box labeled "Form," write the appropriate test form letter shown above. Darken the appropriate circles below your ID number and Form designation. **Use a #2 pencil.**

Mark your answers to the test questions in rows 1-17 of the op-scan sheet. You will have **one hour** to complete this part of the final exam. Your score on this part of the final exam will be the number of correct answers. Turn in the op scan sheet with your answers and the question sheets, including this cover page, at the end of this part of the final exam. Any additional parts of the exam will begin after all students have completed this common part.

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. Use the correct trigonometric substitution to transform the integral: $\int x^3 \sqrt{9-x^2} dx$

(1) $\int 3^4 \sin^3 \theta \cos \theta d\theta$

(2) $\int 3^5 \sin^3 \theta \cos^2 \theta d\theta$

(3) $\int 3^5 \sec^4 \theta \tan^2 \theta d\theta$

(4) $\int 3^5 \sec^6 \theta \tan \theta d\theta$

2. Evaluate $\lim_{x \rightarrow (\frac{\pi}{2})^-} \left(x - \frac{\pi}{2} \right) \tan x$.

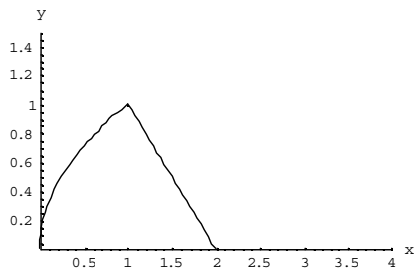
(1) ∞

(2) 1

(3) 0

(4) -1

3. The region pictured below, bounded by the graphs of $y = \sqrt{x}$, $x + y = 2$, and the x -axis, is revolved around the line $x = 3$.



The volume of the resulting solid of revolution is given by:

(1) $2\pi \int_0^2 (3-x)(2-x-\sqrt{x}) dx$

(2) $\pi \int_0^2 [x - (2-x)^2] dx$

(3) $\pi \int_0^1 [(3-y^2)^2 - (1+y)^2] dy$

(4) $\pi \int_0^1 [9 - (2-y-y^2)^2] dy$

4. Evaluate: $\int \frac{x-9}{x^2+3x-10} dx$

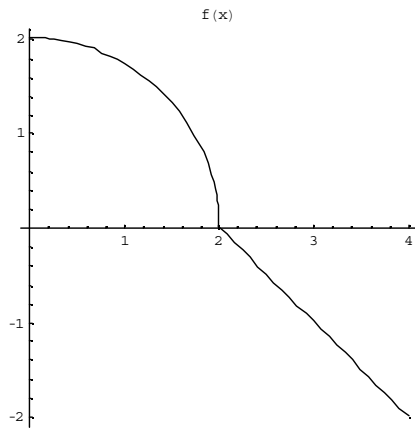
(1) $\ln \left| \frac{(x+5)^2}{x-2} \right| + C$

(2) $\frac{9}{7} \ln |(x-2)(x+5)| + C$

(3) $3 \ln \left| \frac{x+5}{x-2} \right| + C$

(4) $\frac{x^2}{2} + 12x + 98 \ln |x-9| + C$

5. Evaluate $\int_0^4 f(x) dx$, given that the graph of $f(x)$ is as follows.



- (1) $\pi + 2$ (2) $4\pi - 2$ (3) $\pi - 2$ (4) $4\pi - 2\sqrt{2}$

9. The velocity of a particle moving along a coordinate axis is given by $v(t) = \frac{t}{t^2 + 1}$. Find the position function given that the initial position is 5.

- (1) $2 \tan^{-1}(t) + 3$ (2) $\frac{1}{2} \tan^{-1}(t) + 5$ (3) $\frac{1}{(t^2 + 1)^2} + 5$ (4) $\frac{1}{2} \ln(t^2 + 1) + 5$

10. Integrate by parts: $\int e^{2\theta} \sin \theta \, d\theta$

- (1) $\frac{1}{8} e^{2\theta} (2 \sin \theta - \cos \theta) + C$ (2) $\frac{1}{5} e^{2\theta} (2 \sin \theta - \cos \theta) + C$
 (3) $\frac{1}{5} e^{2\theta} (2 \sin \theta + \cos \theta) + C$ (4) $\frac{5}{16} e^{2\theta} (2 \sin \theta + \cos \theta) + C$

11. Water leaked from a tank at a rate of $r(t)$ liters per hour, where the values of $r(t)$ at hour intervals are given in the table below. Use as many of the data points as possible and Simpson's Rule to approximate the total amount of water that leaked out during the first four hours.

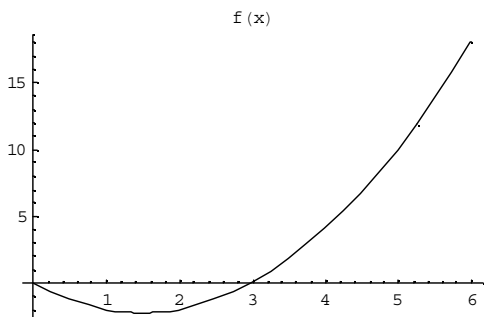
Time (t)	Rate $r(t)$
0	7
1	5
2	4
3	3
4	1

- (1) 48 liters (2) 16 liters (3) $\frac{64}{5}$ liters (4) $\frac{40}{3}$ liters

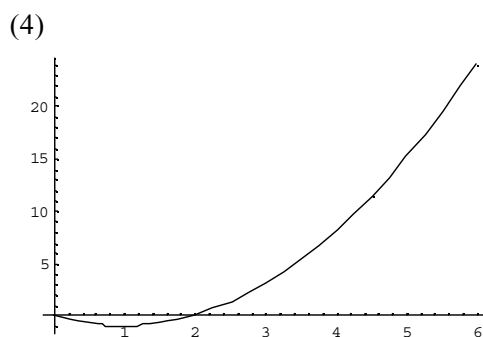
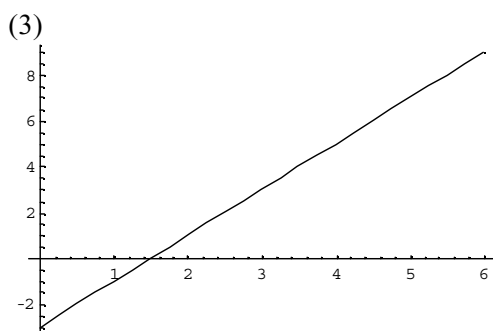
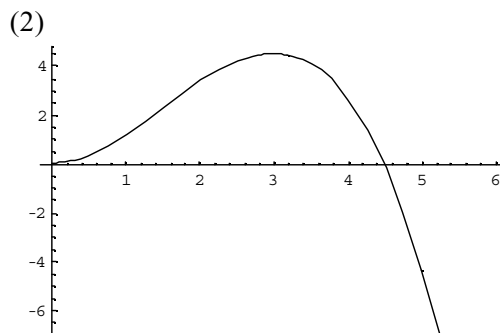
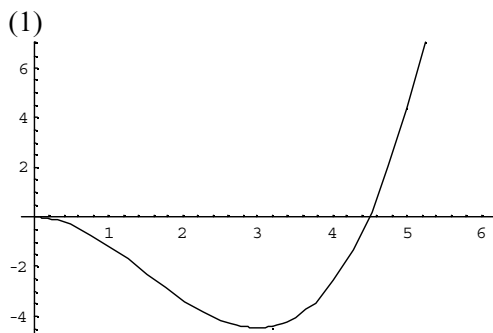
12. If $f(x) = \int_1^{x^2} \cos t dt$, then $f'(x) =$

- (1) $\cos(x^2) - \cos(1)$ (2) $2x \sin(x^2)$ (3) $2x \cos(x^2)$ (4) $\sin(x^2) - \sin(1)$

13. The following is a graph of the function $f(x)$.



Which of the following is a graph of an antiderivative of $f(x)$?



14. Evaluate $\int_{-1}^8 \frac{dx}{x^{4/3}}$.

- (1) The integral is divergent. (2) $\frac{-9}{2}$ (3) $\frac{-3}{2}$ (4) $\frac{3}{2}$

15. After 3 days, the radioactive element polonium-214 decayed to 74% of the original amount. How much time in days would elapse before only 37% of the original amount remains?

- (1) 6 (2) $\frac{\ln 0.74}{3 \ln 0.37}$ (3) $\frac{3 \ln 0.37}{\ln 0.74}$ (4) $\frac{3 \ln 0.74}{\ln 0.37}$

16. Integrate $\int e^{x+e^x} dx$.

- (1) $e^{e^x} + C$ (2) $e^x + C$
 (3) $x + e^x + C$ (4) $e^{x+e^x} + C$

17. Given the following brief table of integrals, evaluate $\int_{\sqrt{2}}^2 \frac{1}{x^2 \sqrt{4x^2 - 7}} dx$.

- $\int \frac{du}{u^2 \sqrt{a^2 - u^2}} = -\frac{1}{a^2 u} \sqrt{a^2 - u^2} + C$
- $\int \frac{du}{u^2 \sqrt{u^2 - a^2}} = \frac{\sqrt{u^2 - a^2}}{a^2 u} + C$
- $\int \frac{du}{u \sqrt{2au - u^2}} = -\frac{\sqrt{2au - u^2}}{au} + C$
- $\int \frac{du}{u \sqrt{u^2 - a^2}} = \frac{1}{a} \sec^{-1} \frac{u}{a} + C$

(1) $\frac{4}{\sqrt{7}} \sec^{-1} \sqrt{\frac{16}{7}} - \sec^{-1} \sqrt{\frac{8}{7}}$ (2) $\frac{3 - \sqrt{2}}{28}$

(3) $\frac{-6 + 2\sqrt{2}}{14}$ (4) $\frac{3 - \sqrt{2}}{14}$