Form A

Math 1206 Common Part of Final Exam December 13, 2002

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 1-16 of the op-scan sheet. You have 1 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. The masses m_i are located at the points P_i as follows:

   $m_1 = 5,\ P_1(2, 3);$ $m_2 = 4,\ P_2(-2, -3);$ $m_3 = 1,\ P_3(6, 2);$ $m_4 = 6,\ P_4(1, -4).$

   What is the $x-$coordinate of the center of mass?

   (a) $-\frac{3}{2}$ (b) $-\frac{7}{8}$ (c) $\frac{7}{8}$ (d) $\frac{3}{2}$

2. Evaluate $\int\left(\frac{1}{t^2} + \sqrt{t}\right) dt$.

   (a) $\frac{-1}{t} + \frac{2}{3}\sqrt{t^3} + C$ (b) $\frac{-1}{3t^3} + \frac{2}{3}\sqrt{t^3} + C$

   (c) $\frac{-1}{t} + \frac{1}{2\sqrt{t}} + C$ (d) $\frac{-1}{3t^3} + \frac{1}{2\sqrt{t}} + C$

3. Evaluate $\int x \ln x\, dx$.

   (a) $\frac{1}{2}x - \frac{1}{2}x\ln x + C$ (b) $\frac{1}{4}x^2\ln x + \frac{1}{2}x^2 + C$

   (c) $\frac{1}{2}x^2\ln x - \frac{1}{4}x^2 + C$ (d) $\ln x - x\ln x + x^2\ln x + C$

4. Suppose $f(x)$ and $g(x)$ are continuous functions and

   $\int_0^2 f(x)\, dx = 3,$ $\int_2^5 4f(x)\, dx = 12,$ $\int_0^2 2g(x)\, dx = 8,$ $\int_2^5 g(x)\, dx = -5.$

   Then $\int_0^5 (2f(x) + 7g(x))\, dx =$

   (a) -3 (b) 5 (c) 7 (d) 12

5. The solution of the initial value problem $\frac{dy}{dx} = 3 + e^{2x},\ y(0) = 2$, is:

   (a) $\frac{3}{2} + 3x + \frac{1}{2}e^{2x}$ (b) $2 + 3x + xe^{2x}$

   (c) $\frac{5}{3} + 3x + \frac{1}{3}e^{3x}$ (d) $2 + 3x + e^{2x}$

6. Evaluate $\int 3\,x^2 \cos(x^3)\,dx$.

(a) $\sin(x^3) + C$

(b) $x^3 \sin(x^3) + C$

(c) $x^3 \sin(\frac{1}{4}\,x^4) + C$

(d) $18\,x^3 \cos(3\,x^2) + C$

7. Use the table below to determine the correct estimate for $\int_0^2 (4\,x^2 - x)\,dx$ using the **trapezoid rule** with $n = 4$ intervals.

x	0	0.5	1	1.5	2
4 x^2 - x	0	0.5	3	7.5	14

(a) 7 (b) 8 (c) 9 (d) 12

8. A cylindrical tank is 12 feet tall, has a radius of 4 feet, and is sitting vertically upright on its circular base. The tank is full of water weighing 62.4 pounds per cubic foot. Which one of the following integrals would correctly calculate the work done in pumping water over the top of the tank?

(a) $(16)\,(62.4)\,\pi \int_0^{12} y^2\,dy$

(b) $(16)\,(62.4) \int_0^{12} y\,dy$

(c) $(16)\,(62.4)\,\pi \int_0^{12} (12 - y^2)\,dy$

(d) $(16)\,(62.4)\,\pi \int_0^{12} (12 - y)\,dy$

9. $\int_0^{\frac{\pi}{4}} \frac{1+\sin x}{\cos^2 x}\,dx =$

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

10. $\lim_{x\to 0} (3\,e^x - 2)^{\frac{1}{\sin x}} =$

(a) 1 (b) e (c) $\frac{2}{3}$ (d) 3 (e) e^3

11. A region in the first quadrant is enclosed by the curves $y = 3x$, $y = 4 - x^2$, and the y-axis. An integral to find the volume of the solid formed by rotating this region around the line $x = -2$ is

(a) $\pi \int_0^3 (\frac{1}{3} y)^2 \, dy + \pi \int_3^4 \left(\sqrt{4-y}\right)^2 dy$

(b) $2\pi \int_0^1 (2+x)(4-3x-x^2) \, dx$

(c) $\pi \int_0^3 (\frac{1}{3} y - 2)^2 \, dy + \pi \int_3^4 \left(\sqrt{4-y} - 2\right)^2 dy$

(d) $2\pi \int_0^1 x(4-3x-x^2) \, dx$

12. $\int_0^1 \frac{1}{x^2+3x+2} \, dx =$

(a) $\ln \frac{1}{6} - \ln \frac{1}{2}$ (b) $2\ln 2 - \ln 3$ (c) $\ln 6 - \ln 2$ (d) $3\ln 2$ (e) $\ln 6 + \ln 2$

13. The area of the region enclosed by the curves $y = 2 - x$ and $x = y^2$ is

(a) $\frac{9}{2}$ (b) $\frac{34}{3}$ (c) $\frac{17}{6}$ (d) $\frac{17}{3}$

14. $\int_{-1}^{\infty} \frac{1}{x^2} \, dx$

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

15. If $F(x) = \int_0^x \sqrt{\sin t} \, dt$ for x in $[0, \pi]$, then $F''(\frac{\pi}{6})$ is:

(a) $\frac{\sqrt{2}}{6}$ (b) $\frac{\sqrt{2}}{2}$ (c) $\frac{2}{\sqrt{6}}$ (d) $\frac{2}{\sqrt{3}}$ (e) $\frac{\sqrt{6}}{4}$

16. $\int_0^{\frac{\pi}{2}} \cos^3 x \, dx =$

(a) -1 (b) 0 (c) $\frac{2}{3}$ (d) $\frac{\sqrt{2}}{2}$ (e) 1