Fall 2002 **Math 152 Exam 1** **Test Form A**

PRINT Surname:_____ **Rest of name:**_____

Signature:_____ **Student ID:**_____

Instructor:_____ **Section #:**_____

Calculators may be used only during the last 30 minutes of the test. The ScanTron forms will be collected at the end of the test. **Calculators may not be used to perform "calculus" operations, such as finding indefinite integrals!** Aggies do not **lie**, **cheat**, or steal, nor tolerate those who do.

In Part I, mark the correct choice on your ScanTron with a #2 pencil. For your own records, also mark your choices on your test paper, because your ScanTron will not be returned. **Do not use the ScanTron as scratch paper.** Remember to write your name, section, and test form (A or B) on the ScanTron!

In Part II, all work to be graded must be shown in the space provided, or clearly pointed to therefrom, and your final answer must be clearly indicated. You may use the back of any page for scratch work; any other paper used should be turned in with the test.

POSSIBLY USEFUL FORMULAS

$$\sin^2 A = \frac{1-\cos(2A)}{2} \qquad \int \tan\theta\, d\theta = -\ln|\cos\theta| + C$$

$$\cos^2 A = \frac{1+\cos(2A)}{2} \qquad \int \sec\theta\, d\theta = \ln|\sec\theta + \tan\theta| + C$$

$$\sin A \sin B = \tfrac{1}{2}\cos(A-B) - \tfrac{1}{2}\cos(A+B)$$

$$\sin A \cos B = \tfrac{1}{2}\sin(A-B) + \tfrac{1}{2}\sin(A+B)$$

$$\cos A \cos B = \tfrac{1}{2}\cos(A-B) + \tfrac{1}{2}\cos(A+B)$$

Part I: Multiple Choice (5 points each)

There is no partial credit. Do not use a calculator for symbolic operations, such as evaluating integrals and derivatives.

1. The area bounded by the curves $y = 2x$ and $y = \sqrt{x}$ is

   (A) $\pi \int_0^4 (\sqrt{x} - 2x)\, dx$

   (B) $\int_0^{1/4} (\sqrt{x} - 2x)\, dx$

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

   (D) $\int_0^4 (2x - \sqrt{x})\, dx$

   (E) $2\pi \int_0^4 (2x - \sqrt{x})\, x\, dx$

2. To find the partial-fraction decomposition of $\dfrac{4x^4 + 7x^3 + x^2 + 2x + 5}{(x^2 + 3x + 5)(x - 2)^2(x + 1)}$ you would start from the form

   (A) $4x^2 + \dfrac{A}{x+1} + \dfrac{B}{(x-2)^2} + \dfrac{Cx + D}{x^2 + 3x + 5}$

   (B) $\dfrac{A}{x+1} + \dfrac{B}{(x-2)^2} + \dfrac{Cx + D}{x^2 + 3x + 5} + \dfrac{Ex + F}{(x^2 + 3x + 5)^2}$

   (C) $\dfrac{A}{x+1} + \dfrac{B}{x-2} + \dfrac{Cx + D}{x^2 + 3x + 5}$

   (D) $\dfrac{A}{x+1} + \dfrac{B}{(x-2)^2} + \dfrac{C}{(x-2)} + \dfrac{Dx + E}{x^2 + 3x + 5}$

   (E) $\dfrac{A}{x+1} + \dfrac{B}{(x-2)^2} + \dfrac{C}{x^2 + 3x + 5}$

3. Evaluate $\displaystyle\int_0^{\pi/4} \tan^3 x \sec^2 x \, dx$.

(A) $2\sqrt{3}$

(B) 1

(C) $\dfrac{1}{4}$

(D) $\dfrac{1}{\pi}$

(E) $\dfrac{2}{3\pi}$

4. Find the area of the region bounded by the horizontal axis and the curve $y = \sin(3\pi x)$ between $x = 0$ and $x = \dfrac{1}{3}$.

(A) 1

(B) $6\pi - 2$

(C) π

(D) 2

(E) $\dfrac{2}{3\pi}$

5. An object is moved along the x-axis by a force of magnitude $F(x) = e^{-2x}$. How much work is done as the object moves from $x = 0$ to $x = 3$?

(A) $2(e^6 - 1)$

(B) $\frac{1}{2}(e^6 + 1)$

(C) $2(e^{-6} - 1)$

(D) $\frac{1}{2}(1 - e^{-6})$

(E) It cannot be determined without knowing the mass or weight of the object.

6. Calculate $\displaystyle\int_0^2 \frac{1}{x^2+4}\,dx$.

(A) 1

(B) $\dfrac{\pi}{6}$

(C) $\dfrac{\pi}{8}$

(D) $\dfrac{1}{2\pi}$

(E) $\pi\sqrt{3}$

7. A trigonometric substitution converts the integral $\displaystyle\int \sqrt{x^2+2x-8}\,dx$ to

(A) $3\int \tan^3\theta\,d\theta$

(B) $9\int \tan^2\theta\sec\theta\,d\theta$

(C) $9\int \sin^3\theta\,d\theta$

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

(E) $\int \tan\theta\sec^2\theta\,d\theta$

8. Evaluate $\displaystyle\int_1^2 \ln x\,dx$.

(A) $2\ln 2 - 1$

(B) $3\ln 2 - 2$

(C) $1 - \ln 2$

(D) $\frac{1}{2}(\ln 2)^2$

(E) $(\ln 2)^2 - \ln 2$

9. Find the average value of the function $f(x) = \cos^3 x$ on the interval $\left[0, \frac{\pi}{2}\right]$.

(A) $\frac{4}{3\pi}$

(B) $\frac{3}{\pi}$

(C) $\frac{1}{2}$

(D) $\frac{\pi}{2}$

(E) $\frac{1}{3}$

10. Find the indefinite integral $\int \sqrt{4 - x^2}\, dx$.

(A) $\frac{x}{2}(4 - x^2)^{3/2} + C$

(B) $\frac{2}{3}(4 - x^2)^{3/2} + C$

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

(D) $\frac{x}{2}\sqrt{4 - x^2} + 2\cos^{-1}\left(\frac{x}{2}\right) + C$

(E) $\frac{x}{2}\sqrt{4 - x^2} + 2\sin^{-1}\left(\frac{x}{2}\right) + C$

Part II: Write Out (10 points each)

Give complete solutions ("show work"). Appropriate partial credit will be given. Do not use a calculator for symbolic operations, such as evaluating integrals and derivatives.

11. Evaluate $\int x^2 \sin(3x)\, dx$.

12. Suppose that $g(t)$ is a function satisfying $g(1) = 0$, $g'(3) = 1$, and $g'(5) = 0$ (and assume that the second derivative of g exists). Show that $\int_1^5 g(t)g''(t)\, dt$ is a negative number.

13. The region in the first quadrant bounded by the graphs of $y = \frac{1}{8}x^3$ and $y = 2x$ is revolved about the x-axis. Find the volume of the resulting solid.

14. Evaluate $\int \cos^4 z \, dz$.

15. The region bounded by the curve $y = 5 - x^2$ and the lines $x = 0$, $x = 2$, and $y = 0$ is revolved about the line $x = 2$. Find the volume of the resulting solid.