Exam. I, Math. 120, Fall, 1999

Your name:

**Instructions**: The exam. consists of 12 problems. There is space to work beside each problem. You should make your steps clear and readable. Most of the problems offer multiple-choice answers. You should use the answers to check yourself. It is important to show your work. Partial credit may be given for solutions that are set up correctly, even though the final answer is incorrect, and full credit may not be given for a correct answer that is not supported by correct work.

Please remember your obligations under the honor code.

The spaces below are *not* for answers—but for recording scores.

1.

2.

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10.

11.

12.

1. What is $\int_5^3 x\,dx$ ?

(a) $-10$ (b) $-8$ (c) 0 (d) 8 (e) 10

2. Approximate $\int_1^2 \frac{1}{x}\,dx$, using a Reimann sum. Partition the interval into three equal sub-intervals, and evaluate the function at the left-hand endpoint of each interval.

(a) $\frac{2}{3}$ (b) $\frac{23}{30}$ (c) $\frac{47}{60}$ (d) $\frac{4}{5}$ (e) $\frac{49}{60}$

3. If $G(x) = \int_1^{2x} \frac{1}{t}\, dt$, then what is $G'(2)$ ?

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$ (c) 1 (d) 2 (e) 4

4. Find $\int_0^{\pi} cos^2 x\, sin\, x\, dx$.

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

5. Find the area of the region bounded by $y = 4 - x^2$ and $y = 0$.

(a) $\frac{32}{3}$ (b) $\frac{34}{3}$ (c) 12 (d) $\frac{38}{3}$ (e) $\frac{40}{3}$

6. The region bounded by $y = x$, $y = 2x$, and $x = 1$ is rotated about the $x$-axis. What is the volume of the resulting solid of revolution?

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{2}\,\pi$ (d) $\pi$ (e) $2\pi$

7. The region bounded by $y = \frac{1}{x}$, $y = 0$, $x = 1$, $x = 2$ is rotated about the $y$-axis. What is the volume of the resulting solid of revolution?

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{2}\,\pi$ (d) $\pi$ (e) $2\pi$

8. Find the volume of the solid having base a unit disk, in the $xy$-plane, with center $(0, 0)$, such that the cross sections perpendicular to the $x$-axis are squares.

(a) $\frac{16}{3}$ (b) 6 (c) $\frac{20}{3}$ (d) $\frac{22}{3}$ (e) 8

9. Holding a certain spring at 1 meter beyond its natural length takes a force of 3 N. What is the work done in stretching the spring from its natural length to 2 meters beyond?

(a) 2 J (b) 3 J (c) 4 J (d) 5 J (e) 6 J

10. A rope 50 feet long hangs down the side of a tall building. If the rope weighs 1 lb/ft, what is the work done in lifting it to the top of the building?

(a) 1100 ft-lbs (b) 1150 ft-lbs (c) 1200 ft-lbs (d) 1250 ft-lbs (e) 1300 ft-lbs

11. Complete the statement of the following theorem.

**Mean-Value Theorem for Integrals**: Suppose the function $f(x)$ is continuous on the closed interval $[a, b]$. Then there is some $c$ in the open interval $(a, b)$ such that

$$\int_a^b f(x)\,dx =$$

12. Find the average value of the function $f(x) = x^3$ on the interval $[0, 2]$.

(a) 2 (b) 3 (c) 4 (d) 5 (e) 6