Math 225 Final Examination Fall 2015

Name (print)_____

Name (sign)_____

Bing ID number _____
(Your ID may be checked during or after the test)

Section number_____ Instructor_____

No books, no notes, no electronic devices (calculators, cell phones, smart watches, etc.) Write all your work on the test – nothing else will be graded. **You must show all your work.** Your work must be legible, and the final answers must be reasonably simplified.

On some problems you may be asked to use a specific method to solve the problem (for instance, "Use the Fundamental Theorem of Calculus to find..."). On all other problems, you may use any method we have covered. **You may not use methods that we have not covered.**

Wandering Eyes Policy

You must keep your eyes on your own work at all times. If you are found looking around, you will be warned once, and only once. A second infraction may result in automatic zero on this test, and possibly a referral to the Harpur College Academic Honesty Committee.

For instructor's use only:

1. ____ (10)	4. ____ (10)	7. ____ (15)
2. ____ (15)	5. ____ (10)	8. ____ (15)
3. ____ (15)	6. ____ (10)	**TOTAL:**

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1. (10 points) Find the area of the region bounded by the curves $x = y^2$ and $x = 4$.

2. (15 points) The region bounded by the curves $x = y^2$ and $x = 4$ is rotated about the line $x = -1$.

a) Set up the integral that represents the volume of the resulting solid using the **washers** method. You must draw a typical washer or otherwise justify your formula. **Do not evaluate the integral.**

b) Set up the integral that represents the volume of the resulting solid using the **shells** method. You must draw a typical shell or otherwise justify your formula. **Do not evaluate the integral.**

3. (15 points) The region bounded by the curves $x = y^2$ and $x = 4$ is rotated about the line $y = 5$.

a) Set up the integral that represents the volume of the resulting solid using the **washers** method. You must draw a typical washer or otherwise justify your formula. **Do not evaluate the integral.**

b) Set up the integral that represents the volume of the resulting solid using the **shells** method. You must draw a typical shell or otherwise justify your formula. **Do not evaluate the integral.**

4. (10 points) Evaluate the integral (definite or indefinite).

a) $\int_0^{\pi} x \cdot \sin(4x)\, dx$

b) $\int \sqrt{x} \cdot \ln x\, dx$

5. (10 points) Find the volume of the solid obtained by rotating the region bounded by $y = x^3$, $y = 4x$, $x \geq 0$ about the x-axis.

6. (10 points) A catapult shoots a ball straight up in the air with the initial velocity of 20 m/s. Find when the ball is 15 m above the ground on the way down. (The time is measured in seconds, starting from the time the ball is shot).

NOTE: Assume that the acceleration of gravity is 10 m/s^2 and ignore the drag.

7. (15 points) What is the smallest possible total surface area (top, bottom and side) of the right circular cylinder of volume (16π) m^3? Justify.

8. (15 points)
a) Evaluate the integral

$$\int_0^{\pi} x^2 \sin x \; dx$$

b) Find the average value on the segment $[0, \pi]$ of the function

$$f(x) = x^2 \sin x$$

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