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001

Math 113 Exam 1

Feb 1-3, 2016 (Late Day: Feb 4, 2016)

Name: _____

Section: _____

Instructor: _____

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Instructions

- I) Do not write on the barcode area at the top of each page, or near the four circles on each page.
- II) Fill in the correct boxes for your BYU ID and for the correct answer on the multiple choice completely. Multiple choice questions are 5 points each.
- III) For questions which require a written answer, show all your work in the space provided and justify your answer.
- IV) Simplify your answers.
- V) No books, notes, or calculators of any type are allowed.
- VI) There is no time limit on this exam.

**Part I: Multiple Choice Questions:** *Mark the correct answer. (5 points each)*

1 Consider the solid obtained by rotating the region bounded by the curves $y = x^2$, $x = 1$, $y = 0$, about $y = -2$. Which of the following integrals represents the volume of the solid if we apply the *washer method*?

$\pi \int_0^1 [(x^2 + 2) - 2] dx$

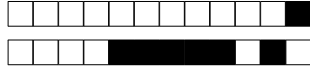
$\pi \int_0^1 [(x^2 + 2) - 2]^2 dx$

$\pi \int_0^1 [(x^2 - 2)^2 + 2^2] dx$

$\pi \int_0^1 [(x^2 + 2)^2 - 2^2] dx$

$2\pi \int_0^1 [(x^2 + 2)^2 - 2^2] dx$

$\pi \int_0^1 [(x^2 - 2) + 2] dx$



2 Consider the solid obtained by rotating the region bound by the curves $y = x^2$, $x = 1$, $y = 0$, about the line $y = -2$. Which of the following integrals represents the volume of the solid if we apply the *cylindrical shell method*?

$2\pi \int_0^1 [(x^2 + 2)^2 - 2^2] dx$

$\pi \int_0^1 ((y - 2)(1 - \sqrt{y}) dy$

$\pi \int_0^1 ((y - 2)(1 + \sqrt{y}) dy$

$\pi \int_0^1 (y + 2)(1 - \sqrt{y}) dy$

$2\pi \int_0^1 (x + 2)x^2 dx$

$2\pi \int_0^1 (y + 2)(1 - \sqrt{y}) dy$

3 If 200 ft-lb of work are needed to stretch a spring from its natural length to 1 ft beyond its natural length, what is the spring constant k ?

$k = 400$ lb/ft

$k = 20$ lb/ft

$k = 4$ lb/ft

$k = 40$ lb/ft

$k = 2$ lb/ft

$k = 200$ lb/ft



4 What is the average of the function $2 \cos x$ on the interval $[-\pi/2, \pi/2]$?

- 2π
- 4
- $\frac{4}{\pi}$
- 0
- 4π
- $\frac{2}{\pi}$

5 What is $\int_1^2 x \ln x \, dx$?

- $2 \ln 2 + \frac{3}{4}$
- $4 \ln 2 - \frac{3}{2}$
- $2 \ln 2 + \frac{15}{8}$
- $2 \ln 2 - \frac{15}{8}$
- $2 \ln 2 - \frac{3}{4}$
- $4 \ln 2 - \frac{15}{4}$



6 What is $\int_0^{\pi/2} \sin^2 x \cos^3 x \, dx$?

- $\frac{1}{6}$
- $\frac{2}{15}$
- $\frac{1}{12}$
- 0
- 1
- $-\frac{2}{15}$

7 What is $\int_0^{\pi/4} \sin^2 x \, dx$?

- $\frac{1}{2}$
- $\frac{\pi}{4} + \frac{1}{2}$
- $\frac{\pi}{8} - \frac{1}{4}$
- $-\frac{\pi}{8}$
- $\frac{\pi}{8} + \frac{1}{4}$
- $\frac{\pi}{8}$



8 What is $\int_0^{1/2} \frac{x^2}{\sqrt{1-x^2}} dx$?

$\frac{\pi}{12} + \frac{\sqrt{3}}{8}$

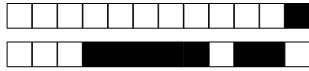
$\frac{\pi}{12} - \frac{\sqrt{3}}{8}$

$-\frac{\pi}{12} + \frac{\sqrt{3}}{8}$

$-\frac{\sqrt{3}}{2} + 1$

$\frac{\sqrt{3}}{2} - 1$

$\frac{\sqrt{3}}{2} + 1$

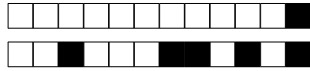


+1/7/54+

Part II: *Justify your answer and show all work for full credit.*

9 0 1 2 3 4 5 6 7 8 9 10 **DON'T MARK**

Find the area of the region bounded by the parabolas $y = 2x^2$ and $y = 4 + x^2$.



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10

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The base of a solid is an elliptical region on the xy -plane enclosed by $\frac{1}{9}x^2 + \frac{1}{4}y^2 = 1$, and the cross sections perpendicular to the y -axis are squares. Find the volume of the solid.

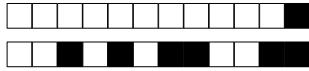


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Use the **method of cylindrical shells** to find the volume of the solid obtained by rotating the region bounded by the curve $y = \ln x$ which lies between $x = 1$, $x = 2$, and the x axis about the line $x = -1$.

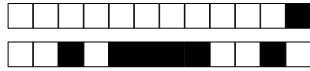


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Evaluate the integral $\int x^2 \cos x \, dx$.

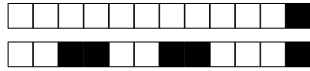


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Evaluate the integral $\int_0^{\pi/4} \sec^6 x dx$.



+1/12/49+

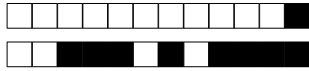
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Evaluate the integral $\int \frac{1}{(1+x^2)^2} dx$.



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