MATH 2260

Midterm Exam II

March 20, 2014

NAME (please print legibly): _____

Your University ID Number: _____

Please complete all questions in the space provided. Draw a box around your final answer. You may use the backs of the pages for extra space, or ask me for more paper if needed. Work carefully, and neatly (2 points on every problem are given for clear presentation of your work or deducted for unclear, messy, or hard-to-understand work).

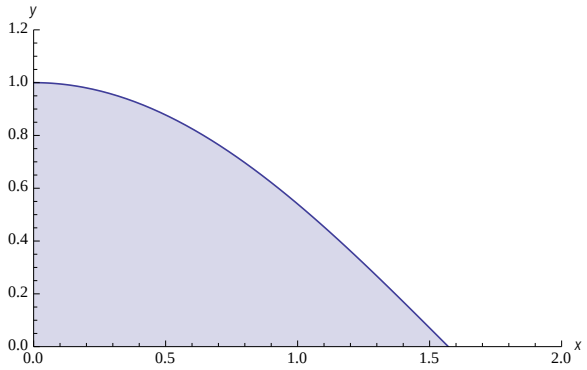
Try to complete the problems you find easier before going back to the harder ones. Good luck!

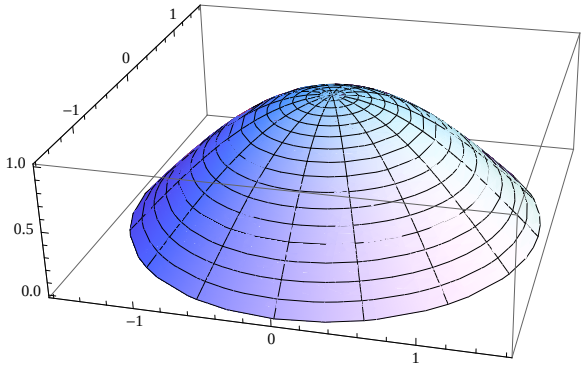
QUESTION	VALUE	SCORE
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
TOTAL	70	

1. (10 points) Use *integration by parts* to evaluate the integral

$$\int x\, e^{3x}\, dx$$

2. (10 points) Use *the method of cylindrical shells* and *integration by parts* to find the volume of the "hill-shaped" solid (shown at right below) created by rotating the shaded area between the curves $y = \cos x$, $y = 0$, and $x = 0$ (show at left in the pictures below) around the y axis.





3. (10 points) Find the integral

$$\int \sec^3 x \tan x \, dx.$$

4. (10 points) Find the integral

$$\int_0^{\pi} \sqrt{1-\cos 2x}\, dx.$$

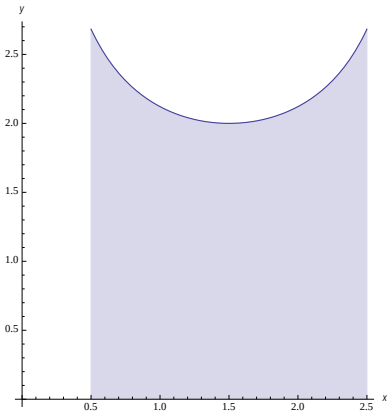
5. (10 points) Use a *trigonometric substitution* to find the integral

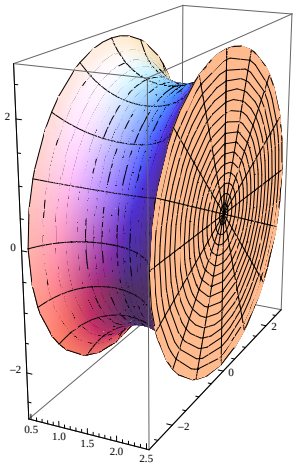
$$\int \sqrt{1-9t^2}\,dt$$

6. (10 points) Use *the washer method* and *partial fractions* to find the volume of the "spool shaped" solid (shown at right in the pictures below) generated by rotating the shaded area below between the curves

$$y = \frac{3}{\sqrt{3x - x^2}}, \quad x = 0.5, \quad x = 2.5, \quad y = 0,$$

(which is shown at left in the pictures below) around the x axis.





7. (10 points) A certain function $f(x)$ has values given by the table:

x	f(x)
0	0
$1/6$	-0.014
$1/3$	-0.057
$1/2$	-0.13
$2/3$	-0.24
$5/6$	-0.40
1	-0.62

The first five derivatives of the function obey the bounds

$$|f'(x)| < 2, \quad |f''(x)| < 5, \quad |f'''(x)| < 12, \quad |f^{(4)}(x)| < 60, \quad |f^{(5)}(x)| < 210$$

on $[0, 1]$. Use your calculator to find the *best numerical estimate you can* for the integral $\int_0^1 f(x)\,dx$ using the information given. Bonus: Find a bound on the error in your estimate.