MA 114 Calculus II — Midterm Exam 2

NAME: SECTION:
LAST FOUR DIGITS OF STUDENT ID:

NOTES:

1. This is a closed book exam. There are six (6) problems on seven (7) pages (including this cover page). Check and be sure that you have a complete exam.
2. You may use a graphing calculator that does not have symbolic manipulation capabilities. Any device capable of electronic communication (cell phone, pager, etc.) must be turned off and out of sight during the exam.
3. Each question is followed by space to write your answer. Please write your solutions neatly in the space below the question. Please erase or mark out any work that you do not want graded. If you need more space, use the backs of the exam pages.
4. Unless specified otherwise, **show your work**; answers without any justification will receive no credit.

Problem	Score	Points
1		15
2		10
3		15
4		15
5		22
6		22
Total		99 + 1 free = 100

Some useful trigonometric identities are

$$\begin{aligned}
\sin 2\theta &= 2\sin\theta\cos\theta \\
\cos^2\theta &= \tfrac{1+\cos(2\theta)}{2} \\
\sin^2\theta &= \tfrac{1-\cos(2\theta)}{2}, \\
\sin^2\theta + \cos^2\theta &= 1 \\
1 + \tan^2\theta &= \sec^2\theta \\
1 + \cot^2\theta &= \csc^2\theta.
\end{aligned}$$

1. (a) Find the Taylor series expansion of $1/x$ about $x = 3$. Your answer should be in the form of an infinite series in which the general term is clearly indicated.

(b) Use your answer to (a) to write down the Taylor polynomial of degree two, $T_2(x)$, relative to $a = 3$ and the function $1/x$.

2. Given the region R in the xy plane bounded by the graphs of $y = 2 - x^2$ and $y = -6 + x^2$. Find the area of R.

3. Given the region, D, bounded by the graph of $y = \sqrt{\sin(2x)}, 0 \leq x \leq \pi/4$, and the lines $y = 0, x = \pi/4$.
(a) Find the volume obtained from rotating D about the x axis. You may express your answer in terms of π.

(b) Set up, <u>do not evaluate</u> an integral for the volume obtained from rotating D about the y axis.

4.(a) A uniform cable hanging over the edge of a tall building is 40 feet long and weighs 60 lbs. How much work (in foot pounds) is required to pull the cable to the top of the building ?

(b) How much work is required to pull just 10 feet of the cable to the top of the building?

5. Find the following integrals. Indicate clearly which integration method you are using. For example if integration by parts is used, write: let $u = \ldots, dv = \ldots$

(a) $\int_0^{\pi} \sin^3 x \, dx$

(b) $\int x^4 \ln x \, dx$

6. Find the following integrals. Indicate clearly which integration technique you are using.

(a) $\int \sqrt{25 - x^2}\, dx$

(b) $\int x \tan^3(x^2) \sec(x^2) dx$