

Quiz 10

DUE: MON. APR. 28

Name: _____

Prof. Ron Buckmire

Date: _____

Friday April 25

Time Begun: _____

Time Ended: _____

Topic covered: Fourier Series and Fourier Polynomials

The **student learning outcome** of this quiz is to provide you with an opportunity to display your understanding of Fourier series and even and odd functions.

Reality Check:

EXPECTED SCORE : _____/10

ACTUAL SCORE : _____/10

Instructions:

1. Once you open the quiz, you have 30 minutes to complete it.
2. You **may not** use the book or any of your class notes, but you may use a calculator. You must work alone.
3. If you use extra paper, please staple it to the quiz before coming to class. **UNSTAPLED SHEETS WILL NOT BE GRADED.**
4. After completing the quiz, sign the pledge below stating on your honor that you have adhered to these rules. Complete the reality check to give yourself a sense of how well you think you did on the quiz.
5. Relax and enjoy...
6. **This quiz is due on Monday, April 28**, at the **beginning** of class. **NO LATE QUIZZES WILL BE ACCEPTED.**

Pledge: I, _____, pledge my honor as a human being and Occidental student, that I have followed all the rules above to the letter and in spirit.

SHOW ALL YOUR WORK

Adapted from Math 128 Fall 2003 Final Exam, Question #4.

Our goal is to find an expression for the N^{th} degree Fourier Polynomial,

$a_0 + \sum_{k=1}^N a_k \cos(kx) + \sum_{k=1}^N b_k \sin(kx)$ for the function $f(x)$ with period 2π defined below:

$$f(x) = \begin{cases} 1, & \text{when } -\pi < x \leq -\pi/2 \\ 0, & \text{when } -\pi/2 < x \leq \pi/2 \\ 1, & \text{when } \pi/2 < x \leq \pi \end{cases}$$

- (2 points) Sketch a graph of $f(x)$ from $-3\pi \leq x \leq 3\pi$. Is the function $f(x)$ even or odd or neither?

- (1 points) What is the average value of $f(x)$ over one period? This value is a_0 .

- (2 points) Find an exact expression for a_k the Fourier cosine coefficients. (Your answer to part (a) should make the answer to part (c) or part (d) an easy question to answer!)

- (2 points) Find an exact expression for b_k the Fourier sine coefficients. (Your answer to part (a) should make the answer to part (c) or part (d) an easy question to answer!)

- (3 points) Use the information gained from your previous answers to write down the 5^{th} -degree Fourier polynomial for $f(x)$.