

Mathematic 108, Fall 2015: Assignment #1

Due: **In your assigned section, either Tuesday, Sep. 8th or Thursday, Sep. 10th.**

Instructions: Please ensure your name, your TA's name and your section number appear on the first page. Also that your answers are legible and all pages are stapled. Page numbers refer to the course text.

Problem #1. Determine the (largest) domain and range of the function given by $f(x) = \frac{1}{\sqrt{1-x^2}}$. Sketch the graph of this function.

Problem #2. Determine the (largest) domain of the function given by $f(x) = \frac{1}{1+\tan^2(x)}$. Explain why this is *not* the same function as $g(x) = \cos^2(x)$.

Problem #3. Ann leaves Baltimore at 7:00AM and drives at a constant speed south along I-95. She passes Washington, DC, which is 40 mi from Baltimore, at 8:30AM

- Express the distance traveled (in miles) in terms of the time traveled (in hours).
- Express the distance traveled (in kilometers) in terms of the time of day (in hours).
- How are these two functions related?

Problem #4. Let $f(x) = \frac{1}{x}$ and

$$g(x) = \begin{cases} 0 & 1 \leq x \leq 2 \\ \frac{1}{x} & x > 2. \end{cases}$$

Determine the formulas for the following functions and their domains:

- fg .
- $f \circ g$.
- $g \circ f$.

Problem #5. Express the following functions in the form $f \circ g$ where f is a rational function and g is a trigonometric function:

- $u(t) = \frac{\cos(t)}{1+\cos(t)}$.
- $w(t) = \frac{\cos(t)}{\sin^2(t)}$.

Problem #6. Show that if f is an even function and g is an odd function, then $f \circ g$ is an even function.

Problem #7. Explain why a periodic function cannot be one-to-one.

Problem #8. Determine the largest value L so that the $f(x) = (x-2)^2 + 2$ is one-to-one on the interval $(-L, L)$. Find the formula for f^{-1} and its domain.

Problem #9. Find a formula for f^{-1} and determine its domain when $f(x) = 1 + \sqrt{1-2x}$.

Problem #10.

- Verify that if f and g are one-to-one, then so is $f \circ g$ and that $(f \circ g)^{-1} = g^{-1} \circ f^{-1}$.
- Use this to find a formula for h^{-1} when

$$h(x) = \frac{1 + e^x}{1 - e^x}.$$

Book Problems.

- Section 1.1: # 4, # 14
- Section 1.2: # 10
- Section 1.3: # 4, # 32, # 34
- Section 1.4: # 20
- Section 1.5: # 10, # 30, # 56.