

Name: \_\_\_\_\_

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On the following pages are selected questions from the MATH 1300 Pre-Calculus final exam in Spring 2015. In groups of 3 or 4, solve as many of these as you can. Show your work.

- You may use your book, Wikipedia, other books, general websites about Mathematics, etc. without special acknowledgement.
- If your group receives any help specifically on the problem you are trying to solve (such as assistance from another group or software that solves the problem), you must acknowledge in writing what help you received and from whom or what source (including internet links). (You do not need to acknowledge your recitation leader.)

score	possible	problem
	6	1
	6	2
	10	3
	6	5
	10	6
	12	9
	20	11
	70	total

\_\_\_\_\_ % net grade

**Problem 1:** (6 points) Given that  $\tan(\theta) = 4$  and  $\sec(\theta) < 0$ , find the exact values of the six circular functions evaluated at  $\theta$ .

$$\sin(\theta) = \underline{\hspace{2cm}} \quad \sec(\theta) = \underline{\hspace{2cm}}$$

$$\cos(\theta) = \underline{\hspace{2cm}} \quad \csc(\theta) = \underline{\hspace{2cm}}$$

$$\tan(\theta) = 4 \quad \cot(\theta) = \underline{\hspace{2cm}}$$

**Problem 2:** (6 points) Find the quotient and remainder when the polynomial  $7x^4 - 5x^3 + 3x - 1$  is divided by  $x - 2$ .

**Problem 3:** (10 points) Solve

$$2 \sin^2(x) = \sin(x) \quad \text{on} \quad [0, 2\pi]$$

**Problem 5:** (6 points) Find the exact values of

(1)  $\arccos\left(-\frac{\sqrt{3}}{2}\right)$

(2)  $\arcsin\left(-\frac{1}{2}\right)$

**Problem 6:** (10 points)

- (1) Use the properties of logarithms to re-write the expression

$$\log_2(x^3 - 4) + 2\log_2(x + 2) - 4\log_2(3x + 2)$$

as a single logarithm.

- (2) Use the properties of logarithms to re-write the expression

$$\log_3 \left( \frac{xy}{z^2 \sqrt[3]{w}} \right)$$

so that the result does not contain any powers, products or quotients.

**Problem 9:** (12 points) Consider the function

$$f(x) = \frac{3x - 7}{x - 1}$$

- (1) Find the domain of  $f(x)$ , write your answer in interval notation.
- (2) Show that  $f(x)$  is one to one on its domain.
- (3) Find an explicit formula for the inverse function  $f^{-1}(x)$ .
- (4) Verify your formula is correct by computing and simplifying  $f \circ f^{-1}(x)$ .

**Problem 11:** (20 points) Consider the rational function

$$f(x) = \frac{x^2 + 4x + 3}{x^2 - 1}$$

- (1) Express the domain of  $f$  in interval notation.
- (2) Find the  $x$  and  $y$  intercepts of  $f$ .
- (3) Find all vertical and horizontal asymptotes.
- (4) Identify any holes.
- (5) Sketch a detailed graph of  $f$ .

