Advanced Functions

Assignment #1

Reference Declaration

Complete the Reference Declaration section below in order for your assigment to be graded.

If you used any references beyond the course text and class notes (such as other texts, discussions with peers or online resources), indicate this information in the space below. If you did not use any aids then explicitly state this in the space provided.

Be sure to cite appropriate theorems throughout your work. You may use shorthand for well-known theorems like the FT (Factor Theorem), RRT (Rational Root Theorem), etc.

Note: Your submitted work must be **your original work**.

Family Name: WongFirst Name: Max

Declared References:

Instructions

1. Organize and express complete, effective and concise responses to each problem.
2. Use appropriate mathematical conventions and notation wherever possible.
3. Provide logical reasoning for your arguments and cite any relevant theorems.
4. Ask your teacher questions if you need any clarification.

Evaluation

D3 Students will compare the characteristics of functions, and solve problems by modelling and reasoning with functions.

Criteria	Level 1	Level 2	Level 3	Level 4
Understanding of Mathematical Concepts	Demonstrates limited understanding	Demonstrates some understanding	Demonstrates considerable understanding	Demonstrates thorough understanding of concepts
Selecting Tools and Strategies	Selects and applies appropriate tools and strategies, with major errors, omissions, or mis-sequencing	Selects and applies appropriate tools and strategies, with minor errors, omissions, or mis-sequencing	Selects and applies appropriate tools and strategies accurately, and in a logical sequence	Selects and applies appropriate and efficient tools and strategies accurately to create mathematically elegant solutions
Reasoning and Proving	Inconsistently or erroneously employs logic to develop and defend statements	Statements are developed and defended with some omissions or leaps in logic	Frequently develops and defends statements with reasonable logical justification	Consistently develops and defends statements with sophisticated and/or complete logical justification
Communicating	Expresses and organizes mathematical thinking with limited effectiveness	Expresses and organizes mathematical thinking with some effectiveness	Expresses and organizes mathematical thinking with considerable effectiveness	Expresses and organizes mathematical thinking with a high degree of effectiveness

1. **Describe** the characteristics of the function $f(x) = -2|x-3|+2$ by filling in the table given below. **Write** a paragraph briefly explaining how you determined each characteristic.

Characteristic	
domain	$\{x \mid x \in \mathbb{R}\}$
range	$\{y \mid y \in \mathbb{R}, y < 2\}$
zero(s)	x = 4, 2
y-intercept	(0,-4)
interval(s) of increase	none
interval(s) of decrease	
discontinuities	none
symmetry	even symmetry along vertical line $x = 3$
end behaviours	as $x \to \infty, f(x) \to -\infty$ as $x \to -\infty, f(x) \to -\infty$

2. **Solve** both inequalities.

   (a) Solve $|3x - 5| \leq 2$

   (b) Solve $-|-2x - 1| < -4$

3. A 10 foot long stem of bamboo is broken in such a way that its tip touches the ground 3 feet away from the base of the stem. **Determine** the height of the break.

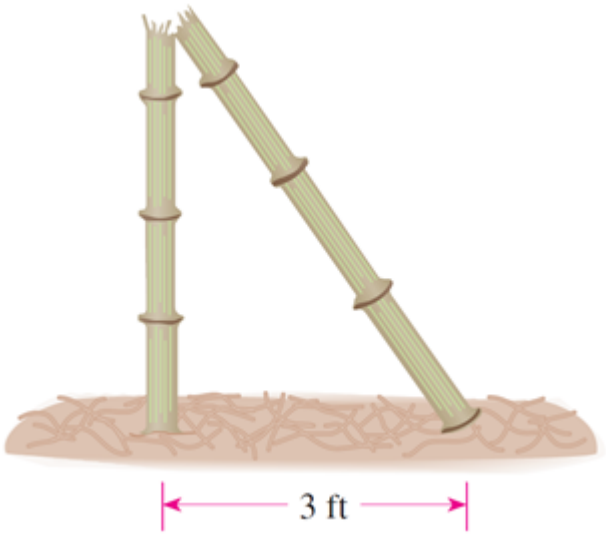

Figure 1: Diagram from Problem 3

4. **Define** (rewrite) $f(x) = |x^3 - x|$ as a piecewise function not including any expressions involving absolute value.

5. **Determine** the inverse of the function $g(x) = \dfrac{-2}{x-1} + 4$. **Prove** that g and g^{-1} satisfy the expression $g(g^{-1}(x)) = x$.