231 TEST 1

You may use your notebook during the last half hour of this exam.
You may NOT use calculators, cell phones, loose papers, or peeking.

Math 231
February 3, 2011

Name: _____
By printing my name I pledge to uphold the honor code.

1. Fill in the blanks. You need not show work for these problems; do calculations on the scrap page, please.

_____ Write the contrapositive of the statement "If $x \geq 2$, then $x \geq 1$".

_____ Write the converse of the statement "If $x \geq 2$, then $x \geq 1$".

_____ If we want to require that $3x+1$ is with distance 1 of 10, how close must x be to 3?

_____ If $f(x)$ is decreasing on $\mathbb{R}$ then $a < b$ implies what?

_____ Give an example of a power function that is not a polynomial.

_____ Give an example of a function $f(x)$ that is its own inverse.

_____ Give an example of a function $f(x)$ that is both even and odd.

_____ Suppose that a stereo speaker's optimal volume v, in decibels, is in the range described by the inequality $|v-85| < 35$. What is the lowest optimal volume for this speaker?

_____ List two real numbers a and b for which $|a+b|$ is strictly less than $|a| + |b|$.

_____ Give an example of a real number a with the property that $|a| = -a$, if possible.

_____ Find the average rate of change of $f(x) = \frac{1}{x}$ on $[1, 3]$.

_____ Find the domain of the function $f(x) = \dfrac{\sqrt{x-1}}{x^2-4}$.

2. Calculate! Show your work clearly and put boxes around final answers.

a) Solve the inequality $\dfrac{x^2 - 7x + 10}{x^2 - 3x + 2} \leq 0$ by using a labeled number line.

b) Solve the equation $\dfrac{\frac{x+2}{x} - \frac{2}{x-1}}{x+1} = 0$. Be careful to omit any extraneous solutions.

c) Write the function $f(x) = |9 - x^2|$ as a piecewise function that does not involve absolute values, where each piece is defined on an interval of x-values.

d) Use the values given in the table to fill in the missing values. There is only one way to correctly fill in the table. (You do not need to show work for this problem.)

x	0	1	2
$f(x)$	3		1
$g(x)$		1	
$(f \cdot g)(x)$	6		
$(f \circ g)(x)$		4	3

3. Give precise definitions, with mathematical notation, for each of the following. Be careful that you do not just list an associated property or give a rough description; actual definitions are called for here.

a) What is the definition of a ***rational number***?

b) What is the definition of a ***function***?

c) What is the definition of a ***one-to-one function***?

d) What is the definition of a ***local maximum*** of a function?

e) What is the definition of a ***linear function***?

f) What is the definition of a ***rational function***?

g) What is the definition of an ***odd function***?

h) Draw a picture of two of your favorite animals having a battle for three free points.

Survey for 2 bonus points: How do you think you did? What is a question or topic that could have been on this exam, but wasn't?

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sCRAP (I will not be grading anything on the scrap page)