Name_____ Date_____ Period_____

Worksheet 2.1—Algebraic Domains of Functions

Give simplified, exact values for all answers. **No Calculator is Permitted.**

I. Multiple Choice

_____1. If $f(x) = \dfrac{\sqrt{x-1}}{x^2 - 9}$, then the domain of f is given by the interval

   (A) $(1, \infty)$ (B) $(-3, 3)$ (C) $[1, 3) \cup (3, \infty)$ (D) $(-3, 3) \cup (3, \infty)$ (E) $[1, 3)$

_____2. Which of the following functions has no vertical asymptote(s)?

   (A) $f(x) = \dfrac{x-7}{(x-7)(x-5)}$ (B) $f(x) = \dfrac{x}{x^2 - x - 1}$ (C) $f(x) = \dfrac{1}{x-2}$

   (D) $f(x) = \dfrac{x^2 - 9x + 20}{(x-4)(x-5)}$ (E) None, they all have at least one VA

_____3. Which of the following functions has a hole at $(1, 4)$?

   (A) $f(x) = \dfrac{x-1}{(x-1)(x-5)}$ (B) $f(x) = \dfrac{x-1}{(x+1)^2}$ (C) $f(x) = \dfrac{4}{x-1}$

   (D) $\dfrac{(x-1)(11x+1)}{(x-1)(x+2)}$ (E) $f(x) = \begin{cases} x^2 + 3, & x \le 1 \\ x + 4, & x > 1 \end{cases}$

_____4. Which of the following equations represents y as a function of x?
   (A) $x^2 + 3y = 5$ (B) $y = x^2 - 7x + y^2$ (C) $x^2 - y^3 - 9 = y^{3/4}$ (D) $|x| - |y| = 0$ (E) None of these

_____5. Which set of ordered pairs represents a function? (There may be more than one correct answer.)
   (A) $\{(a,3),(b,5),(c,9),(d,\ )\}$ (B) $\{(a,-3),(b,6),(c,1),(b,9)\}$ (C) $\{(a,3),(b,3),(c,3),(b,-3)\}$
   (D) $\{(a,5),(a,-9),(a,0),(a,12)\}$ (E) $\{(a,3),(b,5),(c,9),(d,9)\}$

II. Short Answer

6. Find the domains of the following functions. Use correct notation.

a) $f(x) = \dfrac{1}{\sqrt{x^2 - 4}}$

b) $g(x) = \dfrac{3x}{x^2 + 4x + 3}$

c) $h(x) = \sqrt{x^2 + 5x - 6}$

d) $k(x) = \dfrac{2}{\sqrt{(x-2)^2}}$

e) $j(x) = \dfrac{-1}{1 - \sqrt{x+2}}$

f) $k(x) = \dfrac{4x - 1}{\left(x^2 + 3\right)^{1/3}}$

g) $m(x) = \dfrac{\dfrac{2}{x} - \dfrac{x}{3}}{\dfrac{x-5}{x}}$

7. Find all the discontinuities (if any) of the following functions, then classify them as Holes, VA's, or Jumps.

a) $f(x) = \dfrac{x-1}{x^3 - x}$

b) $f(x) = \dfrac{x-5}{x^2 + 25}$

c) $f(x) = \dfrac{3x-6}{|x-2|}$

d) $f(x) = \dfrac{3x^2 - 3x - 18}{4x^2 - 36}$

e) $f(x) = \begin{cases} x^2, & x \neq 3 \\ 9, & x = 3 \end{cases}$

f) $f(x) = \begin{cases} x^2, & x \neq 3 \\ -9, & x = 3 \end{cases}$

g) $f(x) = \begin{cases} x^2, & x < 3 \\ 5x - 6, & x \ge 3 \end{cases}$

h) $f(x) = \begin{cases} x^2, & x < 3 \\ 3x, & x > 3 \end{cases}$

i) $f(x) = \begin{cases} x^2, & x < 3 \\ 7, & x = 3 \\ 3x - 1, & x > 3 \end{cases}$

j) $f(x) = \begin{cases} \dfrac{1}{x}, & x < 1 \\ \dfrac{x-3}{x^2 + x - 12}, & x > 1 \end{cases}$