Math-8 Exam #0

Name: _____

This exam is closed book and notes. You may use a calculator; however, no other electronics are allowed. Show all work; there is no credit for guessed answers. All answers should be in exact values, unless you are specifically asked for an approximate value.

1). Identify each subset of the real numbers and give an example of an element from each set.

subset	name	example
$\mathbb{N}$	_____	_____
$\mathbb{Z}$	_____	_____
$\mathbb{Q}$	_____	_____
$\mathbb{R} - \mathbb{Q}$	_____	_____
$\mathbb{R}$	_____	_____

2). Let:

$$A = \{x \in \mathbb{R} \mid -2 \leq x < 2\}$$

$$B = \{x \in \mathbb{R} \mid x > 1\}$$

a). Graph A

b). Graph B

c). What is the interval notation for A?

d). What is the interval notation for B?

e). What is $A \cup B$ in interval notation?

f). What is $A \cap B$ in interval notation?

3). Identify each of the following real number axioms:

$\forall\, a, b \in \mathbb{R}, a + b \in \mathbb{R}$

_____

$\forall\, a, b \in \mathbb{R}, ab \in \mathbb{R}$

_____

$\forall\, a, b \in \mathbb{R}, a + b = b + a$

_____

$\forall\, a, b \in \mathbb{R}, ab = ba$

_____

$\forall\, a, b, c \in \mathbb{R}, (a + b) + c = a + (b + c)$

_____

$\forall\, a, b, c \in \mathbb{R}, (ab)c = a(bc)$

_____

$\exists\, 0 \in \mathbb{R}, \forall\, a \in \mathbb{R}, a + 0 = 0 + a = a$

_____

$\exists\, 1 \in \mathbb{R}, \forall\, a \in \mathbb{R}, a1 = 1a = a$

_____

$\forall\, a \in \mathbb{R}, \exists\, (-a) \in \mathbb{R}, a + (-a) = (-a) + a = 0$

_____

$\forall\, a \in \mathbb{R} - \{0\}, \exists\, a^{-1} \in \mathbb{R}, aa^{-1} = a^{-1}a = 1$

_____

$\forall\, a, b, c \in \mathbb{R}, a(b + c) = ab + ac$

_____

$\forall\, a, b, c \in \mathbb{R}, (a + b)c = ac + bc$

_____

4). Complete each of the following exponent rules:

$a^m a^n =$ _____

$(a^m)^n =$ _____

$\dfrac{a^m}{a^n} =$ _____

$a^{-1} =$ _____

$a^{-n} =$ _____

$\sqrt[n]{a} =$ _____

$\sqrt[q]{a^p} =$ _____

5). Simplify the following. Your answer should contain *no* radicals and *no* negative exponents.

$$\dfrac{z\sqrt{x^2 y z^{\frac{1}{2}}}}{xy^{\frac{1}{2}} z^2}$$

6). Complete the following expansion and factoring rules:

$$(a - b)^2 =$$

_____

$$a^2 - b^2 =$$

_____

$$a^2 + 2ab + b^2 =$$

_____

$$a^3 + 3a^2b + 3ab^2 + b^3 =$$

_____

7). Expand the following:

$$(x\sqrt{y} + 2z)^2$$

8). Factor each of the following by inspection:

    a). $x^2 + 2x + 1$

    b). $x^2 - 2x + 1$

    c). $x^2 + 4x - 21$

    d). $x^2 - 4x - 21$

    e). $4x^2 - 11x - 3$

9). Complete each of the following fraction rules:

$$\frac{a}{c} + \frac{b}{c} = \underline{\hspace{3cm}}$$

$$\frac{a}{b} + \frac{c}{d} = \underline{\hspace{3cm}}$$

$$\frac{a}{b} \cdot \frac{c}{d} = \underline{\hspace{3cm}}$$

$$\frac{\frac{a}{b}}{\frac{c}{d}} = \underline{\hspace{3cm}}$$

10). Consider the following:

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

a). Simplify the expression.

b). State the domain in setbuilder notation.

c). Graph the domain.

d). State the domain in interval notation.