Algebra II

1-3
Basic Properties
of
Real Numbers

Properties of Equality

Property	Description
Reflexive	$x \in \mathbb{R}$, then $x = x$
Symmetric	$x, y \in \mathbb{R}$ if $x = y$, then $y = x$
Transitive	$x, y, z \in \mathbb{R}$ if $x = y$ and $y = z$, then $x = z$
Addition	$x, y, z \in \mathbb{R}$ if $x = y$ then $x + z = y + z$
Multiplication	$x, y, z \in \mathbb{R}$ if $x = y$ then $x \cdot z = y \cdot z$

Field Properties

Name	Addition	Multiplication
Closure	if $x, y \in \mathbb{R}$ then $(x + y) \in \mathbb{R}$	if $x, y \in \mathbb{R}$ then $xy \in \mathbb{R}$
Commutative	$x, y \in \mathbb{R}$ $x + y = y + x$	$x, y \in \mathbb{R}$ $xy = yx$
Associative	$x, y, z \in \mathbb{R}$ $(x + y) + z = x + (y + z)$	$x, y, z \in \mathbb{R}$ $(xy)z = x(yz)$
Identity	$x \in \mathbb{R}$ $x + 0 = x$	$x \in \mathbb{R}$ $x \cdot 1 = x$
Inverse	$x \in \mathbb{R}$ $x + (-x) = 0$	$x \in \mathbb{R}, x \neq 0$ $x\left(\frac{1}{x}\right) = 1$
Distributive	$x, y, z \in \mathbb{R}$ $x(y + z) = xy + xz$	

Closure

Determine whether the following set is closed under addition.

$\{0\}$ Closed

$\{1\}$ No

$\{0, 1\}$ Not Closed

$0 + 0 = 0$ ✓
$0 + 1 = 1$ ✓
$1 + 0 = 1$ ✓
$1 + 1 = 2$ No

Determine whether the following set is closed under multiplication.

$\{0\}$ closed

$\{1\}$ Yes

$\{0, 1\}$ Closed

$0 \cdot 0 = 0$ ✓
$0 \cdot 1 = 0$ ✓
$1 \cdot 0 = 0$ ✓
$1 \cdot 1 = 1$ ✓

Simplify. (pg 17)

9) $2(a + 4) + (-8)$

$2a + 8 + (-8)$

$2a$

Determine if each simplification is true or false.

11) $(-x + 6) + (-6 + x) = 0$

$-x + 6 + -6 + x = 0$

$0 + 0 = 0$

$0 = 0$

True!

Name the property used in each step of the simplification.

17) $\frac{1}{2}(1 + 2t)$ Given

$= \frac{1}{2}\cdot 1 + \frac{1}{2}\cdot(2t)$ distributive

$= \frac{1}{2}\cdot 1 + (\frac{1}{2}\cdot 2)t$ associative x

$= \frac{1}{2}\cdot 1 + 1\cdot t$ inverse x

$= \frac{1}{2} + t$ identity x

□

23) Show that if $3x + (-12) = 0$, then $x = 4$ by justifying each indicated step

$3x + (-12) = 0$	Given
$[3x + (-12)] + 12 = 0 + 12$	a) addition prop =
$3x + [(-12) + 12] = 0 + 12$	b) associative +
$3x + 0 = 0 + 12$	c) inverse +
$3x = 12$	d) identity +
$\frac{1}{3}(3x) = \frac{1}{3}(12)$	e) multiplication prop =
$\frac{1}{3}(3x) = 4$	substitution
$(\frac{1}{3}\cdot 3)x = 4$	f) associative x
$1\cdot x = 4$	g) inverse x
$x = 4$	h) identity

pg 17
2-32 even

or

Day 1
pg 17 → 1-16 all
25-33 all

Day 2
pg 17 → 17-24 all