

Properties of Real Numbers

• Example 1

Properties of real numbers:

- (a) Commutative property of addition
- (b) Commutative property of multiplication
- (c) Associative property of addition
- (d) Associative property of multiplication
- (e) Additive identity property
- (f) Additive inverse property
- (g) Multiplicative identity property
- (h) Multiplicative inverse property
- (i) Distributive property
- (j) Multiplication property of zero

Identify, by letter, the property used in each labeled step of the following simplification.

$$\begin{aligned}
 & y\left(9 + \frac{1}{y}\right) - 9y + 1 \\
 & = y \cdot 9 + y \cdot \frac{1}{y} - 9y + 1 \quad \text{A.} \\
 & = 9y + y \cdot \frac{1}{y} - 9y + 1 \\
 & = 9y + 1 - 9y + 1 \quad \text{B.} \\
 & = 9y - 9y + 1 + 1 \quad \text{C.} \\
 & = 0 + 2 \quad \text{D.} \\
 & = 2 \quad \text{E.}
 \end{aligned}$$

- A. i, the distributive property has been applied.
- B. h, the multiplicative inverse property has been applied.
- C. c, the commutative property of addition has been applied.
- D. f, the additive inverse property has been applied.
- E. e, the additive identity property has been applied.

● ● ● CHECK YOURSELF 1

Use the properties of real numbers listed in the example and identify by letter the property used in each labeled step of the following simplification.

$$\begin{aligned} & 3 \cdot x \left(\frac{1}{x} - 1 \right) + x \cdot 3 - 3 \\ & = 3(1 - x) + x \cdot 3 - 3 \\ & = 3(1 - x) + 3x - 3 && \text{A.} \\ & = 3 - 3x + 3x - 3 \\ & = (3 - 3) + (3x - 3x) && \text{B.} \\ & = 0 + 0 && \text{C.} \\ & = 0 && \text{D.} \end{aligned}$$

● ● ● CHECK YOURSELF ANSWER

1. **A.** (b); **B.** (a); **C.** (f); **D.** (e).

1.9 Exercises

Name _____

Section _____

Date _____

A N S W E R S

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Identify, by letter, the property used in each labeled step of the following simplifications.

$$\begin{aligned} 1. \quad & 7\left[3y\left(\frac{1}{y} - 1\right) + 3y - 3\right] \\ & = 7\left[(3y)\frac{1}{y} - 3y + 3y - 3\right] && \text{A.} \\ & = 7\left[3\left(y\frac{1}{y}\right) - 3y + 3y - 3\right] && \text{B.} \\ & = 7[3(1) - 3y + 3y - 3] && \text{C.} \\ & = 7[3 - 3y + 3y - 3] && \text{D.} \\ & = 7[(3 - 3) + (3y - 3y)] && \text{E.} \\ & = 7[0 + 0] \\ & = 7 \cdot 0 \\ & = 0 && \text{F.} \end{aligned}$$

$$\begin{aligned} 2. \quad & 4y(1 \cdot y) + 2 + (y - y) \\ & = 4y(1 \cdot y) + 2 + 0 && \text{A.} \\ & = 4y(y) + 2 + 0 && \text{B.} \\ & = 4y^2 + 2 && \text{C.} \end{aligned}$$

1.A. _____

B. _____

C. _____

D. _____

E. _____

F. _____

2A. _____

B. _____

C. _____

3. A.

B.

C.

4. A.

B.

C.

D.

E.

5. A.

B.

C.

$$3. y \cdot \frac{1}{y} + (1 + 3y) - 3y$$

$$= 1 + (1 + 3y) - 3y$$

$$= 1 + 1 + (3y - 3y)$$

$$= 1 + 1 + 0$$

$$= 2$$

A.

B.

C.

$$4. -x\left(1 - \frac{1}{x}\right) - x \cdot 2\left(\frac{1}{2x}\right)$$

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

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

$$= -x + 1 - 1$$

$$= -x + 0$$

$$= -x$$

A.

B.

C.

D.

E.

$$5. -3(y + 0) + 7y + 4$$

$$= -3y + (-3)(0) + 7y + 4$$

$$= -3y + 0 + 7y + 4$$

$$= -3y + 7y + 4$$

$$= 4y + 4$$

$$= 4(y + 1)$$

A.

B.

C.