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Last Name, First Name	Discussion Section	Student ID

Worksheet 1 • Find The Error

1. Suppose that x , y , and z are real numbers. Determine whether or not the following statements are true or false. If they are true, say why they are true. If they are false, supply a counterexample.

(a) If x and y are not zero, then

$$\frac{z}{x} + \frac{z}{y} = \frac{z}{x+y}.$$

(b) For any x ,

$$\sqrt{x^2 + 9} = x + 3.$$

(c) For any positive x ,

$$\sqrt{x^2 + 9} = x + 3.$$

(d) If z is negative and x and y are non-zero, then

$$x > y \quad \text{implies that} \quad zx > zy.$$

2. Is there anything wrong with the following statement? The absolute value of a number x is always positive, therefore

$$\begin{aligned} |x + y|^2 &= |(x + y)^2| \\ &= |x^2 + 2xy + y^2| = x^2 + 2|x||y| + y^2. \end{aligned}$$

3. Is the following statement true? If x is a real number, then

$$\sqrt{9-x}\sqrt{9-x} = 9-x.$$

Under what conditions will the statement be true?

4. What is wrong with this “argument”? If $x = y$, then

$$x^2 = xy.$$

Subtract y^2 from both sides of the above equality, to obtain the equality

$$x^2 - y^2 = xy - y^2.$$

Write both sides of the above equality as products to obtain the equality

$$(x + y)(x - y) = y(x - y),$$

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and therefore

$$x + y = y.$$

Since $x + y$ is equal to $2y$,

$$2y = y, \quad \text{hence,} \quad 2 = 1.$$

- 5.** Is the following statement true? Suppose that A , B , C , D and E are sets. If $A \cap B$ is a subset of E and if $C \cap D$ is a subset of E , then $(A \cup C) \cap (B \cup D)$ is a subset of E .
- 6.** Construct a statement that appears to be true but is actually false. See if you can come up with such a statement, show the statement is false, but convince your peers that your statement is true.