## 6 Proofs that are Invalid

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Invalid proof: a proof that contains errors in reasoning or invalid assumptions
A proof is invalid if it has/uses:
A false assumption
Divides by zero
<ul> <li>Calculation error</li> <li>Reasoning error (faulty logic)</li> </ul>
Circular reasoning
<ul> <li>Violates a p remise (true statement)</li> </ul>
Example 1: Is this a valid proof? If not, find the error:
Thomas is a college student. All college students dislike studying.
Therefore, Thomas dislikes studying.       FALSF         Not a valid proof!       FALSF         Assumption!       False         Example 2: Kimberley claims she can prove that 2 = 3. Show that she has written an invalid proof.
Her proof:
x+y=z $x+y=z$
$3x - 2x + 3y - 2y = 3z - 2z \qquad \frac{-2 - 2}{2 + y - 2} = 0$
3x + 3y - 3z = 2x + 2y - 2z

## FOM 11

Example 3: Is this a valid proof? If not, find the error in reasoning:

Kurt claims to have proven that 2 = 1. For each statement in his proof, determine if it is valid.

Statement	Reason	Valid?
$x = y$ , where $x, y \neq 0$	Given	$\checkmark$
$x^2 = xy$	Multiply both sides by <i>x</i>	$\checkmark$
$x^2 - y^2 = xy - y^2$	Subtract y2 from both sides.	/
(x-y)(x+y) = y(x-y)	Factor out (x-y)	1
$\frac{(x-y)(x+y)}{x-y} = \frac{y(x-y)}{x-y}$	Divide both sides by (x-y) but x=y (given)	No! Canit
x + y = y	so x-y=0	Canit divideby 0!!_si
y + y = y	Substitute y for x since x = y	~
2y = y	Simplify	L
2 = 1	$\mathbf{p}_{\mathbf{v}}$ both sides by y	<i>v</i>

**Example 4:** Is this proof valid? If not, *what type of error* does it have? *Circle the error* and *correct* the proof.

2 = 2 4(2) = 4(1 + 1) 4(2) + 3 = 4(1 + 1) + 3 8 + 3 = 6 + 3 11 = 9 (al culation error) (b) = 10 (b) = 10 (c) = 10

**Example 5:** Mark claims that -3 = 3

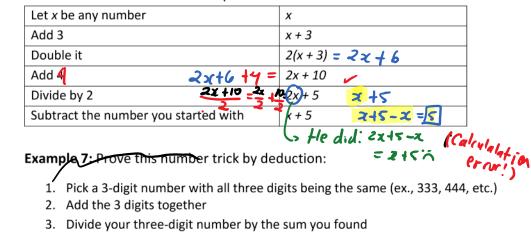
Proof: Assume 
$$-3 = 3$$
   
 $(-3)^2 = 3^2$ 
  
 $9 = 9$ 
  
False assumption!
  
(We Know  $-3 \neq 3$ ).

Therefore: -3 = 3

Where did Mark go wrong?

**Example 6:** Evan created this number trick: *Choose any number. Add 3. Double it. Add 4. Divide by 2. Take away the number you started with.* 

Each time he tries the trick, he ends up with a 5. His proof does not show this result. Where did the error occur in his proof?! Find and correct it!



4. Your answer is 37.

Assignment: Sec 1.5, p. 42# 1 (like Ex. 1 above), 2, 3, 5, 7, 10 (a classic!)

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