CS 173, Fall 18 Examlet 2, Part B

Name:_____

NetID:_____ **Lecture: B**

Discussion: Friday 11 12 1 2 3 4 5

1. (5 points) Is the following claim true? Informally explain why it is, or give a concrete counter-example showing that it is not.

   Claim: For all positive integers a, b, and c, if $\gcd(a, bc) > 1$, then $\gcd(a, b) > 1$ and $\gcd(a, c) > 1$.

   Solution: This is false. Consider $a = b = 3$ and $c = 2$. Then $bc = 6$. So $\gcd(a, bc) = 3 > 1$ but $\gcd(a, c) = 1$.

2. (6 points) Use the Euclidean algorithm to compute $\gcd(1012, 299)$. Show your work.

   Solution: $1012 - 3 \times 299 = 1012 - 897 = 115$

   $299 - 2 \times 115 = 299 - 230 = 69$

   $115 - 69 = 46$

   $69 - 46 = 23$

   $46 - 2 \times 23 = 0$

   So the GCD is 23.

3. (4 points) Check the (single) box that best characterizes each item.

   $7 \mid 0$ true [√] false [ ]

   $k \equiv -k \pmod{k}$ always [√] sometimes [ ] never [ ]

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Discussion: Friday 11 12 1 2 3 4 5

1. (5 points) Is the following claim true? Informally explain why it is, or give a concrete counter-example showing that it is not.

   Claim: For all non-zero integers a and b, if $a \mid b$ and $b \mid a$, then $a = b$.

   Solution: This is false. Consider $a = 3$ and $b = -3$. Then $a \mid b$ and $b \mid a$, but $a \neq b$.

2. (6 points) Use the Euclidean algorithm to compute $\gcd(2737, 2040)$. Show your work.

   Solution:

   $2737 - 2040 = 697$

   $2040 - 697 \times 2 = 2040 - 1394 = 646$

   $697 - 646 = 51$

   $646 - 51 \times 12 = 646 - 612 = 34$

   $51 - 34 = 17$

   $34 - 17 = 0$

   So the GCD is 17.

3. (4 points) Check the (single) box that best characterizes each item.

   $29 \equiv 2 \pmod 9$ true [√] false [ ]

   Two positive integers p and q are relatively prime if and only if $\gcd(p, q) > 1$. true [ ] false [√]