Your Document Title

Your Name

November 8, 2024

Problem 1

If integers a and b are not both zero, then $\gcd(a,b) = \gcd(a-b,b)$.

Solution: S

how inequality both ways. Let $d = \gcd(a,b)$, so $a = dx$ and $b = dy$ for some x, y, and let $e = \gcd(a-b,b)$. We want to show that d divides both $a-b$ and b, so that $d \leq e$. We already have d dividing b since $d = \gcd(a,b)$. We can write $a-b$ as $dx - dy = d(x-y)$, which means $d \mid d(x-y) \implies d \mid a-b$. Since d divides both $a-b$ and b it is a common divisor, and cannot be greater than $e = \gcd(a-b,b)$. Therefore $d \leq e$.
Now to show $e \leq d$, note that e divides b and e divides $a-b$. Therefore e divides $(a-b)+b = a$. Since e divides both a and b it is a common divisor but cannot be greater than the $\gcd(a,b) = d$. Therefore $e \leq d$.

1. 29: If integers a and b are not both zero, then $\gcd(a,b) = \gcd(a-b,b)$.

   Solution: show inequality both ways. Let $d = \gcd(a,b)$, so $a = dx$ and $b = dy$ for some x, y, and let $e = \gcd(a-b,b)$. We want to show that d divides both $a-b$ and b, so that $d \leq e$. We already have d dividing b since $d = \gcd(a,b)$. We can write $a-b$ as $dx - dy = d(x-y)$, which means $d \mid d(x-y) \implies d \mid a-b$. Since d divides both $a-b$ and b it is a commond divisor, and cannot be greater than $e = \gcd(a-b,b)$. Therefore $d \leq e$.

   Now to show $e \leq d$, note that e divides b and e divides $a-b$. Therefore e divides $(a-b)+b = a$. Since e divides both a and b it is a common divisor but cannot be greater than the $\gcd(a,b) = d$. Therefore $e \leq d$

1 Introduction

This is the introduction section.

2 Main Content

This is the main content section.

2.1 Subsection

This is a subsection.

2.1.1 Subsubsection

This is a subsubsection.

3 Conclusion

This is the conclusion section.