

Notebook Problems (continued)

14. Prove that $f : \mathbf{R} \rightarrow \mathbf{R}$ defined by $f(x) = 4x - 3$ is 1-1 and onto.
15. Prove that if $f : X \rightarrow Y$, $A \subseteq Y$ and $B \subseteq Y$ then $f^{-1}(A \cap B) = f^{-1}(A) \cap f^{-1}(B)$.
16. Prove that if $f : X \rightarrow Y$, $A \subseteq X$ and $B \subseteq A$ then $f(B) \subseteq f(A)$.
17. Let $f : A \rightarrow B$ and $g : B \rightarrow C$. Prove that if f and g are 1-1 and onto, then $g \circ f$ is 1-1 and onto.
18. Prove that $\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \dots + \frac{1}{n(n+1)} = \frac{n}{n+1}$ for all $n \geq 1$.
19. Prove that $2^n + 1$ is divisible by 3 for all odd $n \geq 1$.
20. Prove that $3^n \leq n!$ for all $n \geq 7$.

I'll add 5 more to make a total of 25 on Tuesday.