Q1

Statement 1: False. integers a, b

Proof: We assume that $a-b=3$, then $4(a-b)=4\times 3=12$. So $12 \mid 4(a-b)$ holds. However, $6 \mid 3$ does not hold. So the statement is false $\square$

Statement 2: True.

n is a nature number

Proof: Assume that $3 \mid n$, then there exist an integer k such that $n=3k$. So $2n^2+18=2(3k)^2+18=18k^2+18=9(2k^2+2)$. Since k is an integer, $2k^2+2$ is also an integer. Thus, $9 \mid 2n^2+18$. So for all $n\in\mathbb{N}$ that if $3 \mid n$, then $9 \mid 2n^2+18$. $\square$

this should only be roughwork. Only show the y picked.

Q2. $x^2y-y-1=0$ would be translate as $(x^2-1)y=1$. Since $x>1$, then $x^2-1>0$. So $y=\frac{1}{x^2-1}$. Because $x^2-1>0$, $\frac{1}{x^2-1}>0$. Thus, $x\in\mathbb{R}$ and $x>1$ implies that there exist a $y\in\mathbb{R}$ such that $x^2y-y-1=0$ and $y>0$. $\square$

this should be "for every $x\in A$"

Q3 Assume there exist $x\in A$. Since that every $A\in\mathcal{F}$ is disjoint from B, $\forall x\,(x\in A\rightarrow x\notin B)$. Since $A\in\mathcal{F}$, $A\subseteq\bigcup\mathcal{F}$, so $\forall x\,(x\in A\rightarrow x\in\bigcup\mathcal{F})$. Since A is random, every x in A is in $\bigcup\mathcal{F}$ and is not in B. Thus, every $A\in\mathcal{F}$ is disjoint from B implies that $\bigcup\mathcal{F}$ and B are disjoint. $\square$.

Q3. Assume a random $x\in B$. Given that every $A\in\mathcal{F}$ is disjoint from B, x is not in any of A. Since for every x in A,

y is in $\bigcup \mathcal{F}$ because $A \in \mathcal{F}$, x is not in $\mathcal{F}$. Since x is arbitrary, every $A \in \mathcal{F}$ is disjoint from B implies that $\bigcup \mathcal{F}$ and B are disjoint $\square$.