1. The integers $\mathbb{Z}$ are not a field. Explain.

2. Is $\mathbb{Q}$ a field? Explain.

3. What is the total degree of $xyz$?

4. Find a monomial in $x, y, z$ with total degree 10.

5. $x^\alpha$ is a monomial in $x_1, x_2, x_3, x_4$ with $\alpha = (3, 4, 5, 6)$. Rewrite $x^\alpha$ in terms of $x_1, x_2, x_3, x_4$.

6. What is the total degree of $x^\alpha$?
Let $f$ be the polynomial $x^2 + 1$. For every field $k$, $f$ defines a function $f : k \to k$ by $f(a) = a^2 + 1$, for every $a \in k$.

7. If $k = \mathbb{R}$, find $f(1)$.

Let $\mathbb{F}_2$ be the set $\{0, 1\}$ together with an operation ‘$+$’ defined by $0 + 0 = 0$, $0 + 1 = 1 + 0 = 1$, $1 + 1 = 0$, and an operation ‘$\times$’ defined by $0 \times 0 = 0$, $0 \times 1 = 1 \times 0 = 0$, $1 \times 1 = 1$.

8. If $k = \mathbb{F}_2$, find $f(1)$.

9. If $k = \mathbb{C}$, find $a$ so that $f(a) = 0$.

10. If $k = \mathbb{R}$, find $a$ so that $f(a) = 0$.

11. If $k = \mathbb{F}_2$, find $a$ so that $f(a) = 0$. 