Solutions

2.1

- Base case and inductive step (hypothesis used) ✓.

2.2

- $P(k)$ for an arbitrary $k \geq n_0$ – no more ✓.

2.3

- The step needs the two size-k sets to overlap – fails when $k + 1 = 2$ ✓.

3.1

- Base: $2 = 1 \cdot 2$ ✓.
- Hypothesis stated; then $k(k+1) + 2(k+1) = (k+1)(k+2)$ ✓.
- Closing statement: holds for $k + 1$, hence all $n \geq 1$ ✓.
- Geometric: base $1 = 2^1 - 1$; step $(2^{k+1} - 1) + 2^{k+1} = 2 \cdot 2^{k+1} - 1 = 2^{k+2} - 1$ ✓.

3.2

- (A) Fault: base for $n = 0$ proves the empty case only – the claim starts at $n = 1$; repair: verify $1 = 1^2$ ✓.
- (B) Fault: the step skips $k \to k + 1$; two chains start from separate bases or the step must cover every increment ✓.
- General rule: every increment from base to goal must be spanned by the step (or a second base added) ✓.

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