2. Your first LaTeX assignment is to use LaTeX to produce a document that replicates this one as exactly as possible, with just two differences: First, replace the name above with your own. Second, make the following letter substitutions so that I know that you did not just photocopy this document: in Problems 5 and 8, change each m to n; in Problem 13, change each c to b. Your grade on this assignment will be based on how much your paper looks exactly like this one (including these instructions).
Note: In a regular assignment, for questions with a short answer, you may just respond in a complete sentence (like in 3 below). For questions asking for a proof, restate the assumptions and the statement that you are trying to prove (but you can leave out definitions). For questions where you grade a proof, you can simply give your grade and explanation (as in 21).

3.
a) $A \cap B = \{1, 4, 5\}$.
d) False, because $e > 2$.

5. Prove that every integer that is divisible by 6 is even.

Proof. Suppose $m \in \mathbb{Z}$. Then there is some $k \in \mathbb{Z}$ such that $m = 6k$. Therefore $m = 2(3k)$, and since $3k$ is also in $\mathbb{Z}$, this means that m is divisible by 2 and therefore that m is even. $\square$

8. Prove that if $m \in A$ then $m = -2$, 0, or 3.

Proof. Note that

$$\begin{aligned} m^3 - m^2 - 6m &= m(m^2 - m - 6) && \text{(factor out an } m\text{)} \\ &= m(m+2)(m-3). && \text{(factor the quadratic)} \end{aligned}$$

Therefore since $m \in A = \{m \in \mathbb{Z} \mid m^3 - m^2 - 6m = 0\}$ then $m(m+2)(m-3) = 0$. Thus m must be equal to one of -2, 0, or 3. $\square$

13. Prove that if a, $c \in \mathbb{R}$ with $a \leq c$ then $[c, \infty) \subseteq [a, \infty)$.

Proof. Suppose $a \leq c$ in $\mathbb{R}$. For all $x \in \mathbb{R}$,

$$\begin{aligned} x \in [c, \infty) &\Rightarrow x \geq c \\ &\Rightarrow x \geq c \geq a && (c \geq a \text{ by hypothesis}) \\ &\Rightarrow x \geq a && \text{(transitivity)} \\ &\Rightarrow x \in [a, \infty). \end{aligned}$$

Therefore we have $[c, \infty) \subseteq [a, \infty)$. $\square$

21. Proofs to grade

h) Grade: C. This only shows that $A \subseteq B$. It also needs to show that $B \subseteq A$ to establish that $A = B$. Also they should state "because $f^{-1}(x)$ is onto" after the third step.