Problem 1. Show that for all integers \( n \geq 1 \),
\[
\sum_{j=1}^{n} 3j^2 - 3j = n^3 - n.
\]

Problem 2. Number 6(e) on page 156.

Problem 3. Show that for the Fibonacci numbers \( F_n \), we have for all \( n \geq 1 \), that
\[
F_1 + F_2 + \cdots + F_n = F_{n+2} - 1
\]

Problem 4. Find all integer solutions to
\[
x \equiv 2 \pmod{2711} \\
x \equiv 3 \pmod{27}
\]

Problem 5. Find all integer solutions to
\[
2x + 3y \equiv 2 \pmod{631} \\
3x + 2y \equiv 3 \pmod{631}
\]
You can use the fact that 631 is a prime.

Problem 6. Find a closed form solution to the recurrence relation
\[
a_0 = 2 \\
a_1 = 2 \\
a_n = 5a_{n-1} - 6a_{n-2}
\]

Problem 7. Find a closed form solution to the recurrence relation
\[
a_1 = 8 \\
a_2 = 20 \\
a_n = 4a_{n-1} - 4a_{n-2} \quad (n \geq 3)
\]

Problem 8. For which \( n \) does 3 divide the Fibonacci \( F_n \)? (You need not give a formal proof to validate your answer, but do need to supply some reasoning as to why your answer is correct.)