MTH 210: Communicating in Mathematics
Proof Portfolio Problems 4 and 5

Problem 4
Choose either Problem 4A or Problem 4B to do.

Problem 4A: Prove that the number $\log_2 5$ is irrational. (Note this is the logarithm base 2, not the logarithm base 10 or the natural logarithm.)

Problem 4B: Prove that the number $\sqrt{3} + \sqrt{7}$ is irrational.

Problem 5
Choose either Problem 5A or Problem 5B to do.

Problem 5A: Suppose that a and b are natural numbers such that $a^2 = b^3$. Prove that if $4|b$, then $8|a$.

Problem 5B: For every integer a, prove that if $a^2 - 1$ is even, then $4|(a^2 - 1)$.