Specification and Verification I

(a) What is the difference between the methods of refinement and post hoc verification? List one benefit of using refinement besides creating correct-by-construction programs. [4 marks]

(b) What features are needed in a wide-spectrum language to support refinement? Illustrate your answer by describing constructs found in such a language that are not present in programming languages. [4 marks]

(c) What are the “Laws of Programming” in relation to refinement? Illustrate your answer with a concrete example of a law and contrast your law with a related axiom or rule of Floyd–Hoare Logic. [4 marks]

(d) What does it mean for refinement to be monotonic? Why is monotonicity important? [4 marks]

(e) Exhibit a refinement of \([Y, X=0 \land Y=2\times X]\) to \(X:=0; Y:=0\). [4 marks]