Full Name: _____

Student No: _____

Grade:

Read before you start:

- Please make sure you write your full name and student number on everything you hand in.
- To avoid chaos, please make sure to exactly follow the proctors' instructions.
- The exam has **two parts** and **four phases**:
  - Phase 1 (20 minutes): You work individually on **Part A** and submit your solutions.
  - Phase 2 (60 minutes): You work individually on **Part B** and submit your solutions.
  - Phase 3 (20 minutes): You discuss the problems in **Part B** with other students.
  - Phase 4 (30 minutes): You work individually and submit updated solutions to all or some of the problems in **Part B**.
- Phases 3 and 4 are optional. You can opt to skip them and use their time to continue working individually on **Part B**.
- Important: In order to participate in Phases 3 and 4, you *must* first submit your first attempt on **Part B**.
- **All answers require justifications**.

You can use the remainder of this page as scratch paper.

Part A

1. (15 points) We roll two ordinary dice. Let X and Y be the two numbers that appear. Let W be the maximum of X and Y.

   (a) What are the possible values of W?

   (b) What is the probability distribution of W?

   (c) Find the expected value of W.

2. (15 points) Let X be a continuous random variable with the following cumulative distribution function:

$$F(x) = \mathbb{P}(X \leq x) = \begin{cases} 0 & \text{if } x < -1, \\ \frac{1}{2} + \frac{3}{4}x - \frac{1}{4}x^3 & \text{if } -1 \leq x \leq 1, \\ 1 & \text{if } x > 1. \end{cases}$$

(a) What is the probability that $X > 0$?

(b) Find the probability density function of X.

(c) Find the expected value of X.

You can use this page as extra space for your solutions.