1. (30 points) (Review the WS1S slides.)

   Give a DFA for the set

   $$\{(x, X)\colon x + 1 \in X\}.$$

   Clearly identify which states are ACCEPT, REJECT, and STUPID.

2. (30 points) In this problem all polynomials have integer coefficients and one variable.

   (a) (10 points) Is there a polynomial of degree 1 that has a rational root but does not have an integer root. If YES then give the polynomial. If NO then prove NO.

   (b) (10 points) Is there a polynomial of degree 1 that has a real root but does not have a rational root. If YES then give the polynomial. If NO then prove NO.

   (c) (10 points) Is there a polynomial of degree 2 that has a real root but does not have a rational root. If YES then give the polynomial. If NO then prove NO.

3. (40 points)

   (a) (20 points) What was your **favorite** part of the course IN THE SECOND HALF (P, NP, Dec, Undec) (could be a theorem, a definition, a concept, whatever mathematical thing you want. It cannot be the GET UP AND DANCE we do during break or anything else not-math.)

   (b) (20 points) What was your **least favorite** part of the course IN THE SECOND HALF (P, NP, Dec, Undec) could be a theorem, a definition, a concept, whatever mathematical thing you want. It cannot be the GET UP AND DANCE we do during break or anything else not-math.)

   (c) (0 points, not to hand in) Make up your **cheat sheet** soon so that its not at the last minute.