Problem 1. Since we have now moved on to being online for the entire semester, we are using **Slack** as a primary messaging tool. In this problem, you must do the following:

1. Download Slack client on your computer. You can download the client at the following URL: `http://slack.com/downloads`. You are encouraged to also download the Android/iOS app on your phone.

2. Log into the CS 139 workspace. You should have received an email invitation to join the workspace and set up your Slack account. If you cannot find this email, contact your instructor so that he can resend the invitation.

3. Navigate to the `#introductions` channel on Slack and post a brief introduction of yourself and from what city you will be completing the class from.

The instructor will be logged onto Slack for the entire semester—if you have a question or concern about anything in the class, don't hesitate to reach out. You should also feel free to collaborate with your classmates on problems or discuss class material on Slack as well.

Problem 2. Show that the language

$$\text{ANY}_{\text{DFA}} = \{\langle D \rangle \mid D \text{ is a DFA that accepts at least one string}\}$$

is **decidable** by giving a high-level Turing machine that decides it. You must also provide a brief argument of why your Turing machine successfully decides the language.

Problem 3. Show that the language

$$\text{ANY}_{\text{TM}} = \{\langle M \rangle \mid M \text{ is a TM that accepts at least one string}\}$$

is **Turing recognizable** by giving a high-level Turing machine that recognizes it. You must also provide a brief argument of why your Turing machine successfully recognizes the language.

Bonus Problem. Prove that the language

$$\text{DEC} = \{\langle M \rangle \mid M \text{ is a TM that is a decider}\}$$

is not Turing recognizable.

Hint: Use contradiction. Assume that it *is* Turing recognizable and construct a decidable language that does not have a TM description in DEC.