Final Exam

This is the final exam for Intermediate Computer Science, Semester I, 2017-2018. Except as noted below, you may not use materials previously written by you or anyone else.

There are two sections: written (1/3) and programming (2/3). Before you use a computer, you must turn in your answers to the written questions.

Write all of your solutions on a separate sheet of paper.

Written Questions

(30 points)

In the written portion, you may not consult any sources. Suggested time: 30 minutes.

1. (10 pts) A function `ch-col` takes in a color and changes red by a random amount in the [-15,15] interval, and changes blue by twice that same random amount.

   1. Write a signature for the `ch-col` function.
   2. Explain a method of testing the `ch-col` function. (That is, how do you go about adding testing to this situation?)

2. (10 pts) The data definition for the `game` struct is below.

   ```
   ; STRUCT game: t1=number, t2=number, poss=number
   ; purpose: remember points for team 1 and team 2,
   ; and which team has possession of the ball (1 or 2)
   ```

   Write the `simple-score: game -> game` function that records a two point score for the team that has possession (which is always 1 or 2).

3. (10 pts) An animation uses the `game` struct from the previous question as a model. What could you add to your `big-bang` to help you find the source of errors in your mouse handler like: "game-t1: expected a game, given `12`"? Explain briefly.

4. (10 pts) Meg is writing a program. She is part way done, and now wants to finish the design and test it.

   `(define (f x y any) (* x y))`

   1. Write a signature.
   2. Write one good test for this function.
   3. Why might a function have a useless parameter like that?

Programming Questions

(60 points: do both)

In the programming portion, you may use the book *Picturing Programs*, the Racket Help Desk, your `posn-util.rkt` file, and the class blog.

Your work will be evaluated on the basis of correctness and how well it demonstrates your understanding of the design process.

Suggested time: 60 minutes.

1. **Grapher**. (30 pts) The equation `x=130*sqrt(1-(y/120)^2)` is half of an ellipse when the y-coordinates range from -130 to 130. When the mouse is clicked, jump to the point on the graph with the same y-coordinate as the mouse.

   {{% figure src="half-ellipse.png" %}}

   - Graph using people coordinates in the formula.
   - Display in a 450x220 window.
   - Origin is (225,110) in computer coordinates.

2. **Red light, green light**. (30 pts) A light (circle on the screen) is always either red or green. It changes color randomly every 0.5 seconds. The player is any small image on the screen.

   - Clicking when the light is green moves your player 50 pixels toward the top of the screen.
   - Clicking when the light is red moves your player back to the bottom of the screen.