Name: _____

CS 145 Images and Imagination
Final Exam

Score:

    1. (max 10) _____

    2. (max 8)   _____

    3. (max 6)   _____

    4. (max 10) _____

    5. (max 12) _____

    6. (max 12) _____

    7. (max 10) _____

    8. (max 16) _____

    9. (max 6)   _____

    10. (max 10) _____

Total: (max 100) _____

1. (10 pts total) Color can be represented as RGB.   Each component of RGB can have 256 values (0 to 255). *Explain* where the number 256 comes from?
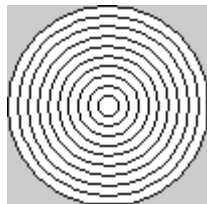
2. (4 pts each, 8 pts total) In the code below, complete the loop code needed to generate the given images (use the Processing variables `width` and `height` where possible):

   a.
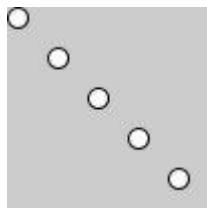
   ```
   size(100,100);
   ellipseMode(CORNER);
   for (          ;          ;              ){

        ellipse(                      );
   }
   ```

   b.

   ```
   size(100,100);
   ellipseMode(CENTER);
   fill(255);

   for (          ;          ;          ) {

             ellipse(                      );

   }
   ```

3. (6 pts) What is value of x and y after executing the following code?
   ```
   int x = 1;
   int y = 8;
   int z = -5;
   x = z;
   z = y;
   y = 2*x;
   ```

   x is _____, y is _____, z is _____

4. (10 pts) A program contains two integer variables called `wide` and `high` as shown below:

```
int wide, high;
wide = random(200);
high = random(200);
```

Write a *conditional statement* (e.g. if-else) that will print the word "huge" if `wide` and `high` are *both* larger than 150. It will print "`tiny`" if `wide` and `high` are *both* less than 50. <u>Otherwise</u>, it will print "`stout`" if `wide` is *larger* than `high` and "`tall`" if `wide` is *smaller* than or equal to `high`.

5. (2 pts each, 12 pts total) For the program below, what is the scope of each of the variables (i.e. enter <u>the range</u> of line numbers for each variable).

```
Line 1      int y = 10;
Line 2
Line 3      void setup() {
Line 4         int rectW = 5;
Line 5         int rectH = 10;
Line 6         drawPict(rectW,rectH);
Line 7      }
Line 8
Line 9
Line 10     void drawPict(int w, int h) {
Line 11        int delta=20;
Line 12        for (int i=0; i < 5; i++) {
Line 13           rect(i*delta,y,w,h);
Line 14        }
Line 15        println("w=" + w + " h = " + h);
Line 16     }
```

a. `y`   Line numbers: _____

b. `rectW`   Line numbers: _____

c. `rectH`   Line numbers: _____

d. `w`   Line numbers: _____

e. `h`   Line numbers: _____

f. `i`   Line numbers: _____

6. (3 pts each, 12 pts total) Given the program below, what does the matrix stack contain at the indicated lines?

```
              void setup() {
                size(200,200);
                translate(width/2,height/2);
                rect(0,0,10,20);
                pushMatrix();
                rotate(radians(45));
Line 1          rect(0,0,10,20);
                popMatrix();
                translate(width/4,height/4);
Line 2          pushMatrix();
                rotate(radians(-90));
Line 3          rect(0,0,10,20);
                popMatrix();
Line 4          rect(0,0,10,20);
              }
```

a. Line 1:

b. Line 2:

c. Line 3:

d. Line 4:

7. (10 pts total) Write a function called `prod` which has 3 parameters of type float (called w1, w2, and w3), and which returns the product of these parameters.

8. (4 pts each, 16 pts total) Complex numbers: Given $z_1 = 1 + 2i$ and $z_2 = 3 - i$. Calculate the following, placing the result in standard form

   a. $z_1 + z_2 = $ _____

   b. $z_1 z_2 = $ _____

   c. $\bar{z}_1 z_1 = $ _____

   d. Length of $z_1 = |z_1| = $ _____

9. (3 pts each, 6 pts total) What is the polar coordinate representation (r, θ) for the following complex numbers

   a. $1 + i$ $(r, \theta) = $ _____

   b. $5i$ $(r, \theta) = $ _____

10. (10 pts) Write a while-loop that will sum the numbers from 1 to 100. Add a line of code after the loop to print the final result.