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 \texttt{wide} and \texttt{high} as shown below:

\begin{verbatim}
int wide, high;
wide = random(200);
high = random(200);
\end{verbatim}

Write a \textit{conditional statement} (e.g. if-else) that will print the word “huge” if \texttt{wide} and \texttt{high} are \textit{both} larger than 150. It will print “tiny” if \texttt{wide} and \texttt{high} are \textit{both} less than 50. \textbf{Otherwise}, it will print “stout” if \texttt{wide} is \textit{larger} than \texttt{high} and “tall” if \texttt{wide} is \textit{smaller} than or equal to \texttt{high}.

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

\begin{verbatim}
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 }
\end{verbatim}

\begin{enumerate}
\item y Line numbers: ___________________
\item \texttt{rectW} Line numbers: __________________
\item \texttt{rectH} Line numbers: __________________
\item \texttt{w} Line numbers: ___________________
\item \texttt{h} Line numbers: ___________________
\item \texttt{i} Line numbers: ___________________
\end{enumerate}
6. (3 pts each, 12 pts total) Given the program below, what does the matrix stack contain at the indicated lines?

```java
void setup() {
    size(200,200);
    translate(width/2,height/2);
    rect(0,0,10,20);
    pushMatrix();
    rotate(radians(45));
    rect(0,0,10,20);
    popMatrix();
    translate(width/4,height/4);
    pushMatrix();
    rotate(radians(-90));
    rect(0,0,10,20);
    popMatrix();
    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. $z_1 + z_2 = \underline{ }$
   
   b. $z_1 z_2 = \underline{ }$
   
   c. $\bar{z}_1 z_1 = \underline{ }$
   
   d. Length of $z_1 = |z_1| = \underline{ }$

9. (3 pts each, 6 pts total) What is the polar coordinate representation $(r, \theta)$ for the following complex numbers
   a. $1 + i$ \hspace{1cm} $(r, \theta) = \underline{ }$
   
   b. $5i$ \hspace{1cm} $(r, \theta) = \underline{ }$

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.