Problem 1

In class, you saw the gamma (γ) function and how it is involved in gamma correction when adjusting for the *displayed* brightness of a pixel. In the old days, macintosh computers used a gamma of $\gamma = 1.8$. Since then, the industry has converged on a standard display gamma of $\gamma = 2.2$. For this assignment, we let $\gamma = 2.2$. Suppose a rendering program has determined the value of a pixel to have the RGB value $(25, 104, 175)$. What will be the value of the *displayed* pixel after gamma correction? You must show all work for full credit.

Problem 2

Similar to problem 1, suppose we have a pixel whose *displayed* RGB value is $(190, 240, 33)$. Assume $\gamma = 2.2$. What was the original RGB value of the pixel, as determined by the rendering program? You must show all work for full credit.

Problem 3

In class, 3 coordinate systems were introduced: the *Image Coordinate System* $I(x, y)$, the *OpenGL-Texture Coordinate System* $T(x, y)$, and the *OpenGL-Viewport Coordinate System* $V(x, y)$. For notation purposes, let $(x_I, y_I) \in I^2$ be a point in the Image coordinate system, $(x_T, y_T) \in T^2$ be a point in the Texture coordinate system, and $(x_V, y_V) \in V^2$ be a point in the Viewport Coordinate system.

(A)

We defined functions to transform xy-coordinates from $I(x, y) \rightarrow T(x, y)$ and $I(x, y) \rightarrow V(x, y)$. Now you must define the function(s) required to transform the xy-coordinates from $T(x_T, y_T) \rightarrow V(x_V, y_V)$. In other words, give a formal definition of the functions $f : T \rightarrow V$ and $g : T \rightarrow V$ such that

$$x_V = f(x_T)$$
$$y_V = g(y_T)$$

(B)

Give a formal definition of the function(s) required to transform xy-coordinates from $V(x_V, y_V) \rightarrow I(x_I, y_I)$. In other words, what are the functions $f : V \rightarrow I$ and $g : V \rightarrow I$ s.t.

$$x_I = f(x_V)$$
$$y_I = g(y_V)$$