CPSC 314 Homework 7

This problem sheet deals with color. Solutions will be discussed in the labs in the week of March 23–27.

1   Color

For the following questions on the CIE diagram, use the figure on the next page (with D as the "white point"). Attempt to find the values requested as accurately and precisely as possible. **Work neatly! In an exam, marks would be deducted for sloppy work (even if you have the correct idea). Show all your work.**

a) Find the *dominant wavelength* of the three colors F, G, and H, with respect to D. If the color does not have a dominant wavelength, indicate this, and find the dominant wavelength of its complementary color.

b) Suppose you had a computer monitor with *four* color primaries, with the following characteristics:

- primary Q, monochromatic light at 470nm

- primary R, with a x-component of chromaticity equal to 0.4, and complementary to Q

- primary H, with chromaticity coordinates indicated on the CIE diagram

- primary S, maximally saturated color complementary to a pure color at 494nm

In the above, *complementary* means with respect to D.

Given these phosphors, draw the points corresponding to their chromaticities on the diagram given (H is already done for you). Also indicate the *gamut* of this display device.

CIE 1931 Standard Colorimetric System

Values along the rim of the diagram are wavelength in nanometers (nm).

Chromaticity coordinates:
D = (0.31300, 0.32900)
F = (0.30000, 0.10000)
G = (0.45650, 0.36450)
H = (0.25000, 0.60000)

y

x

520
515
525
530
535
510
540
545
550
505
555
560
565
500
570
575
580
495
585
590
595
600
490
605
610
615
620
630
640
650
485
480
475
470
465
460
455
450
440
430

·H
·G
·D
·F

0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0

0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8