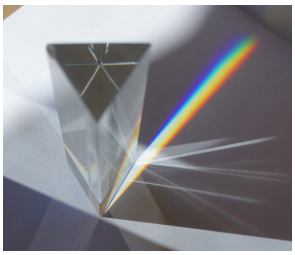
CS 230, Quiz 1

Solutions

Problem 1 (2 points)

A prism is a transparent object that has different indexes of refraction for different wavelengths of light. As a result, for example, red and yellow light bend by different angles as they pass through the prism. In this way, sunlight is divided into a rainbow upon passing through a prism. (See the photograph to the right.) What would be observed if light from a computer screen displaying a solid white background were passed through the prism instead of white light from the sun?



Instead of a rainbow, you might see colored bands for red, green, and blue (in the same places that they occur in the rainbow) with no light between those bands. If the red, green, and blue are not pure, a few bands are observed. A rainbow will not be observed. (For example, sunlight contains light that is actually yellow. Yellow in a computer monitor is red plus green.)

Problem 2 (2 points)

Compute the normal direction for the implicit surface $f(x,y) = 2x^2y^2 - 5xy^2 + 2$ at the point $(2,-1)$. You do not need to simplify your answer.

$$\mathbf{u} = \nabla f = \begin{pmatrix} 4xy^2 - 5y^2 \\ 4x^2y - 10xy \end{pmatrix} = \begin{pmatrix} 4(2)(-1)^2 - 5(-1)^2 \\ 4(2)^2(-1) - 10(2)(-1) \end{pmatrix} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$$

$$\|\mathbf{u}\| = 5$$

$$\mathbf{n} = \frac{\mathbf{u}}{\|\mathbf{u}\|} = \begin{pmatrix} \frac{3}{5} \\ \frac{4}{5} \end{pmatrix}$$