Name:

Student ID:

Written Response

1. Take the unit quaternions $q_1 = \{0, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\}$ and $q_2 = \{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$. Compose the two quaternions $q_1$ and $q_2$ to create a third quaternion $q_3$. Show the algebraic formula as well as the mathematical result. What is the effect of applying $q_3$ to a vector?

2. Given the normalized vertical and horizontal vectors $V$ and $H$ of the image pixel plane, as well as its central focal point $F$, find the position of the center of pixel $(2,3)$ from the bottom left corner. Assume that one pixel is width 1, and the image pixel plane is 10x10 pixels.