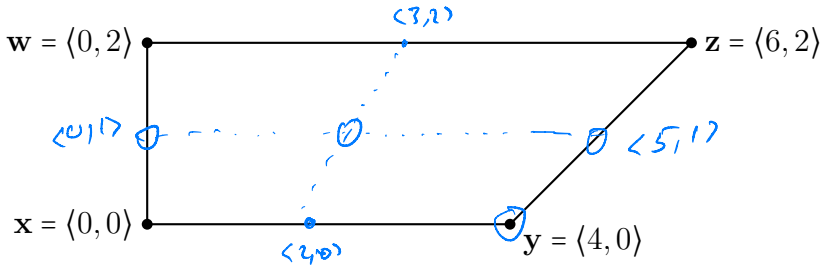
Math 155A - Fall 2022 - Quiz #14 - November 17

Name:

PID:

Bilinear interpolation is used to define a surface $\mathbf{u}(\alpha, \beta)$ from four points $\mathbf{x}, \mathbf{y}, \mathbf{z}, \mathbf{w}$ in $\mathbb{R}^2$. E.g., $\mathbf{u}(0,0) = \mathbf{x}$ and $\mathbf{u}(0,1) = \mathbf{w}$.



1. What are the values of

(a) $\mathbf{u}(1,0)$? $\langle 4, 0 \rangle$

(b) $\mathbf{u}(0, \frac{1}{2})$? $\langle 0, 1 \rangle$

(c) $\mathbf{u}(1, \frac{1}{2})$? $\langle 5, 1 \rangle$

(d) $\mathbf{u}(\frac{1}{2}, \frac{1}{2})$? $\langle \frac{5}{2}, 1 \rangle$

2. Fill in the six blanks with α or β so as to give two formulas that correctly define $\mathbf{u}(\alpha, \beta)$.

(a) $\mathbf{u}(\alpha, \beta) = Lerp(Lerp(\mathbf{x}, \mathbf{y}, \underline{\alpha}), Lerp(\mathbf{w}, \mathbf{z}, \underline{\alpha}), \underline{\beta})$.

(b) $\mathbf{u}(\alpha, \beta) = Lerp(Lerp(\mathbf{x}, \mathbf{w}, \underline{\beta}), Lerp(\mathbf{y}, \mathbf{z}, \underline{\beta}), \underline{\alpha})$.

3. For $\mathbf{x}, \mathbf{y}, \mathbf{z}, \mathbf{w}$ as in problem 1, what are the values of

(a) $\frac{\partial \mathbf{u}}{\partial \alpha}(\frac{1}{2}, 0)$? $\langle 4, 0 \rangle - \langle 0, 0 \rangle = \langle 4, 0 \rangle$

(b) $\frac{\partial \mathbf{u}}{\partial \beta}(\frac{1}{2}, 0)$? $\langle 3, 2 \rangle - \langle 2, 0 \rangle = \langle 1, 2 \rangle$.