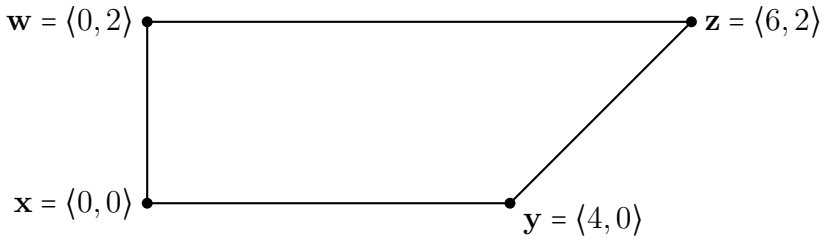
Math 155A - Fall 2022 - Quiz #14 - November 17

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) $\mathbf{u}(1,0)$?

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

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

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

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

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

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

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

(a) $\frac{\partial \mathbf{u}}{\partial \alpha}(\frac{1}{2},0)$?

(b) $\frac{\partial \mathbf{u}}{\partial \beta}(\frac{1}{2},0)$?