

MATH1502 A1 and A2, Quiz 4, June 19, Summer 2007

NAME:

Problem 1 (10 points). Let $f: \mathbb{R}^3 \rightarrow \mathbb{R}^2$ and $g: \mathbb{R}^2 \rightarrow \mathbb{R}^3$ such that

$$f \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} x+y \\ y+z \end{pmatrix}, \quad g \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} x+y \\ x-y \\ \mathbf{x} \end{pmatrix}.$$

Compute

$$g \circ f \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}.$$

$$f \left(\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \right) = \begin{bmatrix} 1+2 \\ 2+3 \end{bmatrix} = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$$

$$g \circ f \left(\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \right) = g \left(\begin{bmatrix} 3 \\ 5 \end{bmatrix} \right) = \begin{bmatrix} 3+5 \\ 3-5 \\ 3 \end{bmatrix} = \begin{bmatrix} 8 \\ -2 \\ 3 \end{bmatrix}$$

Problem 2 (10 points). Compute the single vector specified by the following linear combination:

$$2 \begin{pmatrix} x+y \\ y \\ z \end{pmatrix} - 3 \begin{pmatrix} x \\ x+y \\ z \end{pmatrix} + \begin{pmatrix} x \\ x+y \\ 2z \end{pmatrix}.$$

$$= \begin{pmatrix} 2x+2y - 3x + x \\ 2y - 3x - 3y + x + y \\ 2z - 3z + 2z \end{pmatrix} = \begin{pmatrix} 2y \\ -2x \\ z \end{pmatrix}$$

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Problem 1 (10 points). Let $f: \mathbb{R}^3 \rightarrow \mathbb{R}^2$ and $g: \mathbb{R}^2 \rightarrow \mathbb{R}^3$ such that

$$f \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} x-y \\ y-z \end{pmatrix}, \quad g \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} x-y \\ x+y \\ y \end{pmatrix}.$$

Compute

$$g \circ f \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}.$$

$$f \left(\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \right) = \begin{bmatrix} 1-2 \\ 2-3 \end{bmatrix} = \begin{bmatrix} -1 \\ -1 \end{bmatrix}$$

$$g \circ f \left(\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \right) = g \left(\begin{bmatrix} -1 \\ -1 \end{bmatrix} \right) = \begin{bmatrix} -1 - (-1) \\ -1 + (-1) \\ -1 \end{bmatrix} = \begin{bmatrix} 0 \\ -2 \\ -1 \end{bmatrix}$$

Problem 2 (10 points). Compute the single vector specified by the following linear combination:

$$3 \begin{pmatrix} x+y \\ y \\ z \end{pmatrix} - 2 \begin{pmatrix} x \\ x+y \\ z \end{pmatrix} - \begin{pmatrix} x \\ x+y \\ 2z \end{pmatrix}.$$

$$= \begin{pmatrix} 3x + 3y - 2x - x \\ 3y - 2x - 2y - x - y \\ 3z - 2z - 2z \end{pmatrix} = \begin{pmatrix} 3y \\ -3x \\ -z \end{pmatrix}$$