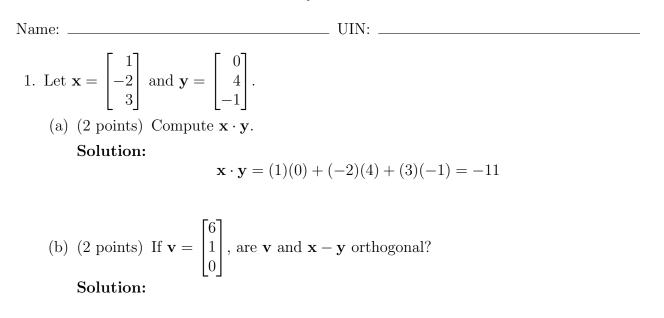
## Math 310 (35180), Fall 2015 Instructor: Chris Skalit Quiz 10



$$\mathbf{v} \cdot (\mathbf{x} - \mathbf{y}) = 6(1 - 0) + 1(-2 - 4) + 0(3 - (-1)) = 0$$

Hence,  $\mathbf{v}$  and  $\mathbf{x} - \mathbf{y}$  are orthogonal.

- (c) (2 points) Compute  $||\mathbf{x} + 2\mathbf{y}||$ . Solution:  $\mathbf{x} + 2\mathbf{y} = \begin{bmatrix} 1\\ 6\\ 1 \end{bmatrix}$ ,  $||\mathbf{x} + 2\mathbf{y}|| = \sqrt{1^2 + 6^2 + 1^2} = \sqrt{38}$ .
- (d) (2 points) Find the distance from  $\mathbf{x}$  to  $\mathbf{y}$ . **Solution:** The distance from  $\mathbf{x}$  to  $\mathbf{y}$  is, by definition,  $||\mathbf{x} - \mathbf{y}|| = \sqrt{(1-0)^2 + (-2-4)^2 + (3-(-1))^2} = \sqrt{53}.$
- (e) (2 points) Find a unit vector u that points in the same direction as x + y.
  Solution: We renormalize x + y by its length, so

$$\mathbf{u} = \frac{\mathbf{x} + \mathbf{y}}{||\mathbf{x} + \mathbf{y}||} = \frac{1}{\sqrt{1 + 2^2 + 2^2}} \begin{bmatrix} 1\\2\\2 \end{bmatrix} = \begin{bmatrix} 1/3\\2/3\\2/3 \end{bmatrix}.$$