

WORKSHEET: NORM, DISTANCE AND ANGLE

1. The **norm** of x is

2. For n -vectors v and w and constant $\beta = -2$, find

(a) $\|v\|$

(b) $\|\beta v\|$

(c) $\|w\|$

(d) $\|v + w\|$

(e) $\|v - w\|$

3. Properties of a norm

4. (Algebra:) For vectors x and y , and scalar α , show that $\|\alpha x + y\|^2 = \alpha^2\|x\|^2 + 2\alpha x^T y + \|y\|^2$.

5. The distance between n -vectors (points in \mathbb{R}^n) x and y is

6. The **root-mean-square value** of the vector v is

7. **std**(v)

8. Fill in the table below

vector, v	$\ v\ $	rms (v)	$(\mathbf{1}^T v)/n$	std (v)
$(1, 1, 1, 1)$				
$(-1, 1, -1, 1)$				
$(\sqrt{2}, \sqrt{2})$				
$(\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, 1, 1, 1)$				