

CAAM 336 · DIFFERENTIAL EQUATIONS

Homework 14

Posted Friday 7 February 2014. Due 1pm Friday 14 February 2014.

14. [25 points]

Determine whether or not each of the following mappings is an inner product on the real vector space \mathcal{V} . If not, show **all the properties** of the inner product that are violated.

(a) $(\cdot, \cdot) : \mathcal{V} \times \mathcal{V} \rightarrow \mathbb{R}$ defined by $(u, v) = \int_0^1 u(x)v'(x) dx$ where $\mathcal{V} = C^1[0, 1]$.

(b) $(\cdot, \cdot) : \mathcal{V} \times \mathcal{V} \rightarrow \mathbb{R}$ defined by $(u, v) = \int_0^1 |u(x)||v(x)| dx$ where $\mathcal{V} = C[0, 1]$.

(c) $(\cdot, \cdot) : \mathcal{V} \times \mathcal{V} \rightarrow \mathbb{R}$ defined by $(u, v) = \int_0^1 u(x)v(x)e^{-x} dx$ where $\mathcal{V} = C[0, 1]$.

(d) $(\cdot, \cdot) : \mathcal{V} \times \mathcal{V} \rightarrow \mathbb{R}$ defined by $(u, v) = \int_0^1 (u(x) + v(x)) dx$ where $\mathcal{V} = C[0, 1]$.

(e) $(\cdot, \cdot) : \mathcal{V} \times \mathcal{V} \rightarrow \mathbb{R}$ defined by $(u, v) = \int_{-1}^1 xu(x)v(x) dx$ where $\mathcal{V} = C[-1, 1]$.