

Question about Lebesque Integral

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The Lebesque integral ,I, of function f with respect to measure u is defined by

$$I(f \, du) = I(f_+ \, du) - I(f_- \, du)$$

where f_+ and f_- are the positive and negative parts of f , respectively. Now my text (Bartle) states that "it is easy to see that if" $f = v - w$, with v and w non-negative, then

$$I(f \, du) = I(v \, du) - I(w \, du)$$

I don't see how this follows from the basic definition of I as supremum of integrals of simple functions. Can someone please help with a proof? Thanks.

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