Expectation of sums of random variables

Ex. Let X and Y be continuous random variables with joint pdf $f_{XY}(x,y)$. Assume that $E(X)$ and $E(Y)$ are finite. Calculate $E(X+Y)$.

$$E(X+Y) = \int_{-\infty}^{\infty}\int_{-\infty}^{\infty}(x+y)f_{XY}(x,y)dxdy = \int_{-\infty}^{\infty}\int_{-\infty}^{\infty}xf_{XY}(x,y)dxdy + \int_{-\infty}^{\infty}\int_{-\infty}^{\infty}yf_{XY}(x,y)dxdy$$

$$= \int_{-\infty}^{\infty}xf_X(x)dx + \int_{-\infty}^{\infty}yf_Y(y)dy = E(X) + E(Y)$$

Same result holds in discrete case.