Problem 7. *Jason:*

We will demonstrate that $\delta f = \sum_{v \in V} f(v)\delta v$. It is a fact that $\delta f(uv) = f(u) - f(v)$. Thus we need to show $\left(\sum_{v \in V} f(v)\delta v\right)(xy) = f(y) - f(x)$. Observe:

$$\left(\sum_{v \in V} f(v)\delta v\right)(xy) = \sum_{v \in V} f(v)\delta v(xy) = f(x)\delta(x)(xy) + f(y)\delta(y)(xy) = f(y) - f(x).$$

Similarly, for φ we compute:

$$\sum_{e \in E} \varphi(e)\partial e(v) = \sum_{e : h_e = v} \varphi(e) - \sum_{e : t_e = v} \varphi(e) = \partial\varphi(e).$$