Consider the problem

$$f(u,v,p,n) = (v - pn) + 2\frac{||v - (v - pn)||}{||u - (v - pn)||} \cdot (u - (v - pn)) \tag{1}$$

and the following substitutions

$$a = v - pn \qquad b = v - a \qquad c = u - a \qquad d = b/c$$
$$e = ||d|| = \sqrt{d^T d} = \sqrt{f} \qquad f = d^T d = d \cdot d \qquad z = a + 2ce$$

Since

$$a' = v' - (p'n + pn') \qquad b' = v' - a' \qquad c' = u' - a' \qquad d' = \frac{b'c - bc'}{c^2}$$
$$e' = \frac{f'}{2e} \qquad f' = 2d'd \qquad z' = a' + 2(c'e + ce')$$

we have

$$\begin{aligned}
f'(u,v,p,n) &= a' + 2(c'e + ce') \\
&= a' + 2\left((u' - a')e + c\left(\frac{f'}{2e}\right)\right) \\
&= a' + 2\left((u' - a')e + c\left(\frac{2d'd}{2e}\right)\right) \\
&= a' + 2\left((u' - a')e + c\left(\frac{2\left(\frac{b'c - bc'}{c^2}\right)d}{2e}\right)\right) \\
&= a' + 2\left((u' - a')e + c\left(\frac{2\left(\frac{(v' - a')c - b(u' - a')}{c^2}\right)d}{2e}\right)\right)
\end{aligned}$$