Problem 6: Correlation coefficients

(6/6 points)
Consider the random variables X, Y and Z, which are given to be pairwise uncorrelated (i.e., X and Y are uncorrelated, X and Z are uncorrelated, and Y and Z are uncorrelated). Suppose that

- $\mathbf{E}[X] = \mathbf{E}[Y] = \mathbf{E}[Z] = 0$,
- $\mathbf{E}[X^2] = \mathbf{E}[Y^2] = \mathbf{E}[Z^2] = 1$,
- $\mathbf{E}[X^3] = \mathbf{E}[Y^3] = \mathbf{E}[Z^3] = 0$,
- $\mathbf{E}[X^4] = \mathbf{E}[Y^4] = \mathbf{E}[Z^4] = 3$.

Let $W = a + bX + cX^2$ and $V = dX$, where $a, b, c,$ and d are constants, all greater than 0.

Find the correlation coefficients $\rho(X-Y, X+Y)$, $\rho(X+Y, Y+Z)$, $\rho(X, Y+Z)$ and $\rho(W, V)$.

1. $\rho(X-Y, X+Y) =$ 0 ✔

2. $\rho(X+Y, Y+Z) =$ 1/2 ✔

3. $\rho(X, Y+Z) =$ 0 ✔

4. $\rho(W, V) =$

   - ○ $\frac{b}{\sqrt{b^2+c^2}}$
   - ○ $\frac{b^2}{\sqrt{b^2+2c^2}}$

- $\frac{bd}{\sqrt{b^2+2c^2}}$
- $\frac{b}{\sqrt{b^2+2c^2}}$ ✔

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DISCUSSION

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