No:

Date: ....

b) $E[X] = \int_{-s}^{s} \frac{3}{4s}\left(1-\left(\frac{x}{s}\right)^2\right) dx$

$= \frac{3}{4s} \cdot \int_{-s}^{s} \left(1-\left(\frac{x}{s}\right)^2\right) dx$

$= \frac{3}{4s} \cdot \int_{-s}^{s} \left(1-\frac{x^2}{s^2}\right) dx$ based on the chain rule: $\int_{-s}^{s} \left(1-\frac{x^2}{s^2}\right) dx = \int_{-s}^{s} 1\, dx - \int_{-s}^{s} \frac{x^2}{s^2} dx$

$= \frac{3}{4s} \cdot \left(\int_{-s}^{s} 1\, dx - \int_{-s}^{s} \left(\frac{x^2}{s^2}\right) dx\right)$

$= \frac{3}{4s} \cdot x\Big]_{-s}^{s} - \frac{1}{s^2} \cdot \int_{-s}^{s} (x^2)\, dx$

$= \frac{3}{4s} \cdot (s)-(-s) - \frac{1}{s^2} \cdot \frac{1}{3}x^3\Big]_{-s}^{s}$

$= \frac{3}{4s} \cdot \left(2s - \frac{1}{s^2} \cdot \left(\frac{1}{3}s^3\right) + \left(\frac{1}{3}s^3\right)\right)$

$= \frac{3}{4s} \cdot \left(2s - \frac{\frac{2}{3}s^3}{s^2}\right)$

$= \frac{3}{4s} \cdot \left(2s - \frac{2s}{3}\right)$

$= \frac{\cancel{3}}{\cancel{4s}} \left(\frac{\cancel{4s}}{\cancel{3}}\right) = 1$

$E(X) = 1$

c) $Var(X) = E((X-\mu)^2)$

$= \int_{-s}^{s} \left(\frac{3}{4s}\left(1-\left(\frac{x}{s}\right)^2\right) - 1\right) dx$

$= \int_{-s}^{s} \frac{3}{4s}\left(1-\left(\frac{x^2}{s^2}\right) - 4s\right) dx$

$= \frac{3}{4s} \int_{-s}^{s} \left(1 - \frac{x^2}{s^2} - 4s\right) dx$

$= \frac{3}{4s} \int_{-s}^{s} 1\, dx - \int_{-s}^{s} \frac{x^2}{s^2} dx - \int_{-s}^{s} 4s\, dx$

$= \frac{3}{4s} \quad x\Big]_{-s}^{s} - \frac{1}{s^2} \int_{-s}^{s} x^2 dx - 4sx\Big]_{-s}^{s}$

$= \frac{3}{4s} \left((s+s) - \frac{1}{s^2} \cdot \left(\frac{1}{3}x^3\right)\Big]_{-s}^{s} - (4s(s) + 4s(s))\right)$

$= \frac{3}{4s} \left(2s - \frac{1}{s^2} \cdot \left(\frac{2}{3}s^3\right) - 8s^2\right)$

$= \frac{3}{4s} \left(2s - \frac{2s}{3} - 8s^2\right)$

$= \frac{3}{4s} \left(\frac{4s}{3} - 8s^2\right)$

$Var(X) = 1 - 6s$