$$
\begin{aligned}
E(aX + bY) &= E(aX) + E(bY) \\
&= aE(X) + bE(Y)
\end{aligned}
$$

$$
E\left(\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}\right) =
$$

$$
\sum_{i=1}^{\nu} Z_i^2 \sim \chi^2(\nu)
$$

$$
(\mu, \sigma^2) = (\nu, 2\nu)
$$

$$
f(x) = \begin{cases} \dfrac{x^{\frac{\nu}{2}-1} e^{-\frac{x}{2}}}{2^{\frac{\nu}{2}} \Gamma\left(\frac{\nu}{2}\right)}, \, x \geqslant 0 \\ 0, \text{ otherwise} \end{cases}
$$