The continuous random variable X has cumulative distribution function F given by

$$F(x) = \begin{cases} 0 & x < -1, \\ \frac{1}{2}(1+x)^2 & -1 \leqslant x \leqslant 0, \\ 1 - \frac{1}{2}(1-x)^2 & 0 < x \leqslant 1, \\ 1 & x > 1. \end{cases}$$

(a) Find the probability density function of X. [2]

(b) Find $P\left(-\frac{1}{2} \leqslant X \leqslant \frac{1}{2}\right)$. [2]

(c) Find $E(X^2)$. [2]

(d) Find $Var(X^2)$. [2]