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

$$F(x) = \begin{cases} 0 & x < 0, \\ 1 - \frac{1}{144} (12 - x)^2 & 0 \le x \le 12, \\ 1 & x > 12. \end{cases}$$

(a) Find the upper quartile of X. [2]

(b) Find
$$Var(X^2)$$
. [5]

The random variable *Y* is given by $Y = \sqrt{X}$.

(c) Find the probability density function of Y. [3]