ELEC 471: Practice Problems with Expectation

Consider a Bernoulli random variable X with PMF

$$P_X(x) = \begin{cases} p, & x = 1 \\ 1 - p, & x = 0 \\ 0, & \text{otherwise} \end{cases}$$

where $0 \le p \le 1$.

Please evaluate the following expectations, and express each answer as a function of p. Show your computations for every case.

a. $E[X]$

b. $E[3X + 2]$

c. $E[X^2]$

d. $\text{Var}[X]$

e. $E\left[\frac{1}{3X+2}\right]$

f. $(E[X])^2$