56. Solution: C
Let $Y$ represent the payment made to the policyholder for a loss subject to a deductible $D$.
That is $0$ for $0 \leq X \leq D$ and $x - D$ for $D < X \leq 1$
Then since $E[X] = 500$, we want to choose $D$ so that
\[
\frac{1}{4} \int_0^{1000} \frac{1}{1000} (x-D) \, dx = \frac{1}{1000} \left( \frac{(x-D)^2}{2} \right)_{x=0}^{x=1000} = \frac{(1000-D)^2}{2000}
\]
\[
(1000 - D)^2 = 2000/4 \cdot 500 = 500^2
\]
$1000 - D = 500$
$D = 500$ (or $D = 1500$ which is extraneous).

57. Solution: B
We are given that $M_x(t) = \frac{1}{(1-2500t)^4}$ for the claim size $X$ in a certain class of accidents.
First, compute $M'_x(t) = \frac{(4)(-2500)}{(1-2500t)^5} = \frac{10,000}{(1-2500t)^5}$
$M''_x(t) = \frac{(10,000)(-5)(-2500)}{(1-2500t)^6} = \frac{125,000,000}{(1-2500t)^6}$
Then
$E[X] = M'_x(0) = 10,000$
$E[X^2] = M''_x(0) = 125,000,000$
$\text{Var}[X] = E[X^2] - (E[X])^2 = 125,000,000 - (10,000)^2 = 25,000,000$
$\sqrt{\text{Var}[X]} = 5,000$

58. Solution: E
Let $X_J$, $X_K$, and $X_L$ represent annual losses for cities J, K, and L, respectively. Then $X = X_J + X_K + X_L$ and due to independence
$M(t) = E[e^{itX}] = E[e^{it(x_j+x_k+x_l)}] = E[e^{itx_j}]E[e^{itx_k}]E[e^{itx_l}]$
$= M_1(t)M_2(t)M_3(t) = (1-2t)^{-3}(1-2t)^{-3.5}(1-2t)^{-4.5} = (1-2t)^{-10}$
Therefore,
$M'(t) = 20(1-2t)^{-11}$
$M''(t) = 440(1-2t)^{-12}$
$M'''(t) = 10,560(1-2t)^{-13}$
$E[X^3] = M'''(0) = 10,560$