Property of $\hat{\beta}$: The least squares estimates of β are unbiased

$$E(\hat{\beta}) = E\left((X^T X)^{-1} X^T Y\right)$$

$$= E\left((X^T X)^{-1} X^T \left(\qquad \right)\right)$$ plug in regression equation for Y

$$= E\left(\qquad + \qquad \right)$$ expand

$$= E\left(\qquad + \qquad \right)$$ simplify term on left $A^{-1}A = I$

$$= \qquad + \qquad E\left(\quad \right)$$ linearity of expectation

$$=$$ regression assumptions $E(\varepsilon) =$