Econ 3040 Midterm Exam Formula Sheet

expected value (mean) of Y (for discrete Y)	$\mu_Y = \sum p_i Y_i$
variance of Y (for discrete Y)	$\sigma_Y^2 = \sum p_i \left(Y_i - \mu_y\right)^2$
standard deviation of Y	$\sigma_Y = \sqrt{\sigma_Y^2}$
covariance between X and Y	$\sigma_{XY} = E\left[\left(X - \mu_X\right)\left(Y - \mu_Y\right)\right]$
correlation coefficient (between X and Y)	$\rho_{XY} = \frac{\sigma_{XY}}{\sigma_X \sigma_Y}$
expected value of the sample average, $\bar{Y}$	$\mathrm{E}(\bar{Y}) = \mu_Y$
variance of the sample average, $\bar{Y}$	$\mathrm{var}[\bar{Y}] = \frac{\sigma_Y^2}{n}$
sample variance of Y (estimator for σ_Y^2)	$s_Y^2 = \frac{1}{n-1}\sum_{i=1}^{n}\left(Y_i - \bar{Y}\right)^2$
sample variance of e (estimator for σ_ϵ^2)	$s_y^2 = \frac{1}{n-2}\sum_{i=1}^{n} e_i^2$
t-statistic	$t = \frac{\text{estimate} - \text{hypothesis}}{\text{std. error}}$
95% confidence interval	estimate $\pm\, 1.96 \times$ std. error
LS estimator for β_1 (single regressor model)	$b_1 = \frac{\sum_{i=1}^{n}\left(X_i - \bar{X}\right)\left(Y_i - \bar{Y}\right)}{\sum_{i=1}^{n}\left(X_i - \bar{X}\right)^2}$
LS estimator for β_0 (single regressor model)	$b_0 = \bar{Y} - b_1 \bar{X}$
variance of b_1 (single regressor model)	$\mathrm{var}\left[b_1\right] = \frac{\sigma_\epsilon^2}{\sum X_i^2 - \frac{\left(\sum X_i\right)^2}{n}}$
LS predicted values (single regressor model)	$\hat{Y}_i = b_0 + b_1 X_i$
LS residuals	$e_i = Y_i - \hat{Y}_i$
R-squared	$R^2 = \frac{ESS}{TSS} = 1 - \frac{RSS}{TSS}$