Class activity EE325
Two variable regression: interval estimation and hypothesis testing

1. **State with reason whether the following statements are true, false, or uncertain. Be precise**

   a) The t test of significance discussed requires that the sampling distributions of estimators $\hat{\beta}_1$ and $\hat{\beta}_2$ follow the normal distribution.

   True. The t test is based on variables with a normal distribution. Since the estimators of β_1 and β_2 are linear combinations of the error u_i , which is assumed to be normally distributed under CLRM, these estimators are also normally distributed.

   b) Even though the disturbance term in the CLRM is not normally distributed, the OLS estimators are still unbiased.

   True. So long as E(u_i) = 0, the OLS estimators are unbiased.
   No probabilistic assumptions are required to establish unbiasedness.

   c) In a regression model that contains the intercept, the sum of the residual is always zero.

   True.

   d) The higher the value of σ^2, the larger is the variance of $\hat{\beta}_2$
   False. A larger σ^2may be counterbalanced by a larger$\sum x_i^2$. It is only if the latter is held constant, the statement can be true.

   e) In the two-variable PRF, if the slope coefficient β_2 is zero, the intercept $\beta_1$is estimated by the sample mean $\bar{Y}$.
   True.

2. The demand for cell phones regression. Letting Y = number of cell phone subscribers and X = purchasing-power-adjusted per capita income. The regression table is provided on Table 2.1.
   a) Is the estimated intercept coefficient significant at the 5% level of significance? What is the null hypothesis you are testing?
   b) Is the estimated slope coefficient significant at the 5% level of significance? What is the null hypothesis you are testing?
   c) Perform analysis of variance for hypothesis testing.
   d) Established a 99% confidence for the true slope coefficient. Interpret the meaning.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.77612129
R Square	0.602364256
Adjusted R Square	0.589938139
Standard Error	7189.047602
Observations	34

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2505338855	2505338855	48.47566274	6.91402E-08
Residual	32	1653836974	51682405.42		
Total	33	4159175829			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	2363.538375	2292.466629	1.031002303	0.310269618	-2306.06334	7033.14009
Cellphone	271.4401548	38.98631762	6.962446606	6.91402E-08	192.0276245	350.8526851