1. e
2. c, d
3. a, c
4. b, d
5. c
6. a, e
7. b

8. (a) $E(u_t \mid Y_{t-1}, Y_{t-2}, \ldots) = 0$ because Y_{t-p} for $p = 1, 2, \ldots$ is a function of $(u_{t-p}, u_{t-p-1}, \ldots)$ and u_t is i.i.d.

   (b) $E(Y_t) = \dfrac{\beta_0}{1-\beta_1}$, $\text{var}(Y_t) = \dfrac{\sigma_u^2}{1-\beta_1^2}$ due to stationarity of Y_t and $E(u_t) = 0$ and $\text{var}(u_t) = \sigma_u^2$

   (c) $\rho_1 = corr(Y_t, Y_{t-1}) = \beta_1$ from $\text{cov}(Y_t, Y_{t-1}) = \beta_1 \, \text{var}(Y_{t-1}) = \dfrac{\beta_1 \sigma_u^2}{1-\beta_1^2}$

   $\rho_2 = corr(Y_t, Y_{t-2}) = \beta_1^2$ from $\text{cov}(Y_t, Y_{t-2}) = \beta_1^2 \, \text{var}(Y_{t-2}) = \dfrac{\beta_1^2 \sigma_u^2}{1-\beta_1^2}$

   $\rho_p = corr(Y_t, Y_{t-p}) = \beta_1^p$ from $\text{cov}(Y_t, Y_{t-p}) = \beta_1^p \, \text{var}(Y_{t-p}) = \dfrac{\beta_1^p \sigma_u^2}{1-\beta_1^2}$

   (d) $Y_{T+1|T} = E(Y_{T+1} \mid Y_T, Y_{T-1}, \ldots) = E(\beta_0 + \beta_1 Y_T + u_{T+1} \mid Y_T, Y_{T-1}, \ldots) = \beta_0 + \beta_1 Y_T = \beta_0 + \beta_1$

9. (a)

	Sample mean ($\overline{earn}$)	Sample standard deviation (s_{earn})	Number of observations (n)
All	369.349	174.952	8033
Those without a college degree (*colgrad* = 0)	320.043	130.012	4233
College graduates (*colgrad* = 1)	424.273	200.315	3800

$\overline{earn}$ is equivalent to the constant term estimate $\hat{c}$ from $earn_i = c + \varepsilon_i$.

$s_{earn} = \sqrt{n \times SE(\overline{earn})^2} = \sqrt{8033 \times 1.952^2} = 174.9519$

From $earn_i = \gamma_0 + \gamma_1 colgrad_i + \epsilon_i$,

$\overline{earn}_{ltcol} = \hat{\gamma}_0 = 320.0428$

$\overline{earn}_{\text{colgrad}} = \hat{\gamma}_0 + \hat{\gamma}_1 = 320.0428 + 104.2304 = 424.2732$

$s_{earn,ltcol} = \sqrt{n_{ltcol} \times SE(\hat{\gamma}_0)^2} = \sqrt{4233 \times 1.9983^2} = 130.0124$

$$s_{earn,\,colgrad} = \sqrt{n_{colgrad} \times \left(SE(\hat{\gamma}_1)^2 - \frac{s^2_{earn,\,ltcol}}{n_{ltcol}} \right)} = \sqrt{n_{colgrad} \times \left(SE(\hat{\gamma}_1)^2 - SE(\hat{\gamma}_0)^2 \right)}$$

$$= \sqrt{3800 \times (3.8148^2 - 1.9983^2)} = 200.315$$

(b) $\hat{\beta}_1 = 110.9976$. Among 30–59 year old, male, full-time wage workers, college graduates earn 1,109,976 KRW more than those without a college degree holding age group constant.
Yes. When testing $H_0 : \beta_1 = 100$ vs. $H_1 : \beta_1 > 100$, the null hypothesis is rejected at the 1% significance level because $t = \dfrac{110.9976 - 100}{3.7588} = 2.9258 > 2.33$.

(c) $\bar{R}^2 = 1 - \dfrac{n-1}{n-k-1}(1 - R^2) = 1 - \dfrac{8033-1}{8033-4}(1 - 0.1342542) = 0.1339$

(d) Including *age3039* in the regression specification with a constant term results in perfect multicollinearity because *age3039* + *age4049* + *age5059* = 1.

(e) $H_0 : \beta_1 = \beta_2 = \beta_3 = 0$ vs. $H_1 : \beta_1 \neq 0$ and/or $\beta_2 \neq 0$ and/or $\beta_3 \neq 0$
The heteroskedasticity-robust *F*-statistic = 393.19 and the *p*-value $< 2.2 \times 10^{-16}$. Thus, we can reject the null hypothesis at the 1% significance level.

(f) No. Even when age (i.e., experience) are controlled for, there could still be systematic differences between college graduates and those without a college degree, for example, in family background or innate ability. If college graduates have higher innate ability and more able people earn more, $\hat{\beta}_1$ would be biased upwards and fail to uncover the causal effect of a college degree on earnings.