1. a. $x = (\ln 9)/6$
   b. $x = 0$
   c. $x = 5/(\ln 2)$
   d. $x = \left({}^{\ln 5}/_{\ln 2}\right) + 2$
   e. $x = e^{5/2}$
   f. $x = 5$

2. $A^* = Ae^{rt} \gg\gg t = {}^{\ln 3}/_{r}$

3. a. $f'(x) = 3xe^{3x} + e^{3x}$, $f''(x) = 9xe^{3x} + 6e^{3x}$

   b. $f'(x) = e^{x^2+3x-2}(2x+3)$, $f''(x) = (4x^2 + 12x + 11)e^{x^2+3x-2}$

   c. $f'(x) = \frac{8x^3}{x^4+2}$, $f''(x) = \frac{48x^2 - 8x^6}{(x^4+2)^2}$

   d. $f'(x) = {}^{(1-x)}/_{e^x}$, $f''(x) = {}^{(x-2)}/_{e^x}$
   e. $f'(x) = \frac{1}{\ln x} - \frac{1}{(\ln x)^2}$, $f''(x) = \frac{2}{(\ln x)^3 x} - \frac{1}{(\ln x)^2 x}$

   f. $f'(x) = \frac{1-\ln x}{x^2}$, $f''(x) = \frac{2\ln x - 3}{x^3}$

4. a. $\begin{bmatrix} 1 & -\beta_2 \\ 1 & -\gamma_2 \end{bmatrix} \begin{bmatrix} q \\ p \end{bmatrix} = \begin{bmatrix} \beta_1 \\ \gamma_1 \end{bmatrix}$

   b. $q^* = {}^{(\beta_2\gamma_1 - \beta_1\gamma_2)}/_{(\beta_2 - \gamma_2)}$, $p^* = {}^{(\gamma_1 - \beta_1)}/_{(\beta_2 - \gamma_2)}$

   c. Clearly, you need $(\beta_2 - \gamma_2) \neq 0$, which is what det A ≠ 0 means in this case.