1. a. f: $\mathbf{R}^1_{++} \rightarrow \mathbf{R}^1_{++}$
   b. q: $(0,8] \rightarrow \mathbf{R}^1_{+}$
   c. Π: $\mathbf{R}^1_{+} \rightarrow (-\infty, 25]$
   d. mc: $\mathbf{R}^1_{+} \rightarrow [10, \infty)$
   e. D: $\mathbf{R}^1_{++} \rightarrow \mathbf{R}^1_{++}$

2. a. A decreasing hyperbolic curve with a p intercept of 8.
   b. $q'(p) = -128p^{-2} = -128/p^2$
   c. $q'(8) = -2$
   d. $q''(p) = 256p^{-3} = 256/p^3$
   e. $q''(8) = ½$

3. a. i. $p(q) = (a/q)^{2/3}$
      ii. $p(q) = a/b - (1/b)q$
      iii. $p(q) = 128/(q+16)$

   b. i. $R(q) = q^{1/3} a^{2/3}$, $R'(q) = (1/3)(a/q)^{2/3}$
      ii. $R(q) = (a/b)q - (1/b)q^2$, $R'(q) = (a/b) - (2/b)q$
      iii. $R(q) = 128q(q+16)^{-1}$, $R'(q) = 128[-q(q+16)^{-2} + (q+16)^{-1}]$

   c. $R'(q) = (1 + 1/\varepsilon)p(q)$

4. a. $MP(L) = q'(L) = 18\,k\,L^{-1/4}$
      $MP'(L) = q''(L) = (-9/2)\,k\,L^{-5/4}$ …note: < 0 …law of diminishing returns
   b. $MU(x) = U'(x) = 10/x + 1/5$
      $MU'(x) = U''(x) = -10/x^2$ …note: < 0 …diminishing marginal utility
   c. $MC(x) = C'(x) = 3\alpha x^2 - 2\beta x - \gamma$
      $MC'(x) = C''(x) = 6\alpha x - 2\beta$

5. a. $\varepsilon = -2/23 \approx -0.08696$; $p(q) = 50 - {}^{q}/_{20}$; $p'(q) = -{}^{1}/_{20}$
   b. $\varepsilon = -3$, $p(q) = \left({}^{72}/_{q}\right)^{1/3}$; $p'(q) = \frac{-2}{(\sqrt[3]{3})q^{4/3}}$
   c. $\varepsilon = -2$ $p(q) = \frac{72}{q} + 2$; $p'(q) = \frac{-72}{q^2}$