1. (a) (NOTE: Answer is not unique.) \( x(t) = 3 + 2t, y(t) = 2, z(t) = 2 + t \)
   (b) \( \text{proj}_{\overrightarrow{PQ}} \overrightarrow{PR} = \left< -\frac{12}{5}, 0, -\frac{6}{5} \right> \)
   (c) \( \left( -\frac{7}{5}, 2, -\frac{1}{5} \right) \)

2. (a) \( r'(t) = \langle 2t, 2, t^2 \rangle, r''(t) = \langle 2, 0, 2t \rangle \)
   (b) (NOTE: Answer is not unique.) \( x(t) = 2t, y(t) = 2t + 2, z(t) = \frac{1}{3} + t \)
   (c) \( \kappa(1) = \frac{2}{5} \)

3. (a) \((0, 1, 1) \) and \((0, 2, 2) \)
   (b) \( z - 3 = -\frac{25}{4}(x - 0) + \frac{1}{4}(y - 5) \)

4. \( \max = \sqrt{3} \) at the critical point \( \left( \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}} \right) \)
   \( \min = 1 \) at each of the “corners”: \((0, 0), (1, 0), \) and \((1, 0) \)

5. HINT: Total volume of \( S \) is 2. You need the value of \( m \) such that \( \int_0^{1/m} \int_{mx}^1 12xy^2 dy dx = 1 \).
   
   ANSWER: \( m = \sqrt{\frac{2}{5}} \)

6. HINT: Convert to polar coordinates. Please.
   
   ANSWER: \( \frac{16}{5} \left( 2 - \sqrt{2} \right) \)

7. (a) \( T_6(x) = \frac{1}{8} + \frac{x^3}{8^2} + x^5 + \frac{x^6}{8^3} \)
   (b) \(-2 < x < 2 \)

8. (a) \( T_1(x) = 2 + \frac{1}{2}(x - 1) \)
   (b) \( \sqrt{3.25} = g(0.5) \approx T_1(0.5) = 1.75 \)
   (c) HINT: \( |g''(x)| = \frac{3}{(3 + x^2)^{3/2}} \). This is positive and decreasing on \([0.5, 1]\).

   The smallest upper bound for \( |g''| \) on this interval is \( \frac{3}{(3.25)^{3/2}} \).
   
   Larger values of \( M \) are also ok.
   
   For example: \( |g''(x)| \leq \frac{3}{3.25^{3/2}} \leq \frac{3}{3^{3/2}} = \frac{1}{\sqrt{3}} < 1. \)

   ANSWER: (Using \( M = 1 \).) \( |f(0.5) - T_1(0.5)| \leq \frac{1}{8} \)