14.4 Answers

1. a) \[ z = 4x + 2 \]
   b) \[ z = 2x + 2y \]

2. a) Note that \[ f_x(x, y) = \frac{x}{2\sqrt{x}} \]
    \[ f_y(x, y) = \sqrt{x} \]. Both of these partials are continuous on their domains which include \((4, 1)\) (since root functions, rational functions, and composites of continuous functions are all continuous on their domains).
    
    \[ L(x, y) = \frac{1}{4}x + 2y - 1 \]

   b) The first part I leave to you.
    
    \[ L(x, y) = 3x \]

3. \[ L(x, y) = -\frac{1}{3}x - \frac{2}{3}y + \frac{20}{3} \]
    
    \[ L(1.08, 1.96) = 2.84 \text{ or } \frac{71}{25} \]

4. \[ L(x, y, z) = \frac{1}{9}x + \frac{4}{9}y + \frac{8}{9}z \]
    
    \[ L(0.98, 4.02, 7.99) = 8.9978 \]
5. a) \[ dz = 2x \ln y^3 \, dx + \frac{3x^2}{y} \, dy \]

b) \[ (ze^{xy} + xyze^{xy}) \, dx + x^2 ze^{xy} \, dy + xe^{xy} \, dz \]

6. \[ L(w, d) = -0.0006(w - 140) + 0.0265(d - 3) + 0.08 \]