1. \[ x - 2y - 4z = -5 \]

2. (a) i. If \( z = 0 \), then the trace is \( x^2 + by^2 = 0 \), which is a single point \((0,0)\). Otherwise, since \( z^2 > 0 \), the traces have the form \( x^2 + by^2 = d \), with \( b, d > 0 \). These are all ellipses.

ii. If \( z = 0 \), then the trace is \( x^2 + by^2 = 0 \), which is a pair of lines. Otherwise, since \( z^2 > 0 \), the traces have the form \( x^2 + by^2 = d \), where \( b < 0 \) and \( d > 0 \). These are all hyperbolas that do not intersect the \( x \)-axis.

(b) In order to contain the line, the equation \( 16t^2 + 4bt^2 + ct^2 = 0 \) must hold for all \( t \), which means that \( 16 + 4b + c = 0 \).

(c) The trace in question has equation \( x^2 + by^2 = 16 + 4b \). This is a circle precisely when \( b = 1 \).

3. (a) The balloon hits the \( xy \)-plane at \( t = 3 \). Speed at \( t = 3 \) is \( \sqrt{385} \).

(b) \( t = \frac{138}{104} \)

(c) T; F; T

4. (a) \((-17, 21, 97)\)

(b) \(66^\circ\)

5. \( \left( \frac{8}{23}, \frac{2}{23}, -\frac{28}{23} \right) \)

6. \(-\frac{1}{28}(e^{-2} - 1)\)

7. (a) \( T_1(x) = T_2(x) = x \)

(b) \( A \left( \frac{1}{2} \right) \approx T_2 \left( \frac{1}{2} \right) = \frac{1}{2} \)

(c) One possible answer: error \( \leq \frac{1}{24} \)

8. (a) \[ f(x) = \sum_{k=0}^{\infty} (-1)^k \frac{x^{2k+2}}{(2k+1)(2k+2)} = \frac{1}{2}x^2 - \frac{1}{12}x^4 + \frac{1}{30}x^6 - \ldots \]

(b) \((-1, 1)\)