MATH 231, Section 3, Solutions Quiz #3 - Fall 2008

Problem 1.
Find symmetric equations for the tangent line to the curve given by the vector function \( r = \langle t, \cos t, e^t \rangle \) at \( P(0, 1, 1) \)

**Solution** The point \( P(0, 1, 1) \) corresponds to \( t = 0 \) since \( r(0) = \langle 0, 1, 1 \rangle \).
Moreover, \( r'(t) = \langle t, -\sin t, e^t \rangle \) and \( r'(0) = \langle 1, 0, 1 \rangle \)
Therefore, symmetric equations for the tangent line to the curve are:
\[
\frac{x - 0}{1} = \frac{z - 1}{1}, \quad y = 1
\]

that is, \( x = z - 1, \quad y = 1 \)

Problem 2. Find parametric equations of the line segment from \( P(1, 1, 1) \) to \( Q(2, 1, 3) \)

**Solution** A vector equation of the line segment from \( P \) to \( P \) is
\[
r(t) = (1 - t)(1, 1, 1) + t(2, 1, 3) = (1 + t, 1, 1 + 2t) \quad \text{with} \quad 0 \leq t \leq 1
\]

Parametric equations of the line segment from \( P(1, 1, 1) \) to \( Q(2, 1, 3) \) are
\[
x = 1 + t, \quad y = 1, \quad z = 1 + 2t \quad \text{with} \quad 0 \leq t \leq 1.
\]

Problem 3. Match each of the following equations its graph
\[
(a) \quad x^2 + y^2 + \frac{z^2}{2} = 1 \quad (b) \quad x^2 - y^2 + z^2 = 1 \quad (c) \quad x^2 - y^2 - z = 0 \quad (d) \quad x^2 - y - z^2 = 0
\]

**Solution**
(a)- IX, ellipsoid
(b)- XI, hyperloid of one sheet
(c)- III, hyperbolic paraboloid
(d)- V hyperbolic paraboloid