1) Find a unit normal vector to the surface at the given point.

a) $x^2y^3 - y^2z + 2xz^3 = 4$, $(-1,1,-1)$

b) $\sin(x-y) - z = 2$, $\left(\frac{\pi}{3}, \frac{\pi}{6}, -\frac{3}{2}\right)$

2) Find an equation of the tangent plane to the surface at the given point.

a) $z = x^2 + y^2 + 3$, $(2,1,8)$

b) $x = y(2z-3)$, $(4,4,2)$

3) Find an equation of the tangent plane and find symmetric equations of the normal line to the surface at the given point.

a) $xyz = 10$, $(1,2,5)$

b) $y \ln xz^2 = 2$, $(e,2,1)$

4) Given the surface $x^2 + y^2 + z^2 = 14$ and the surface $x - y - z = 0$ find the following:

a) Symmetric equations of the tangent line to the curve of intersection of the surfaces at the point $(3,1,2)$.

b) The cosine of the angle between the gradient vectors at the point $(3,1,2)$.

c) Determine whether or not the surfaces are orthogonal at the point of intersection $(3,1,2)$.

5) Find the angle of inclination θ of the tangent plane to the surface at the given point.

a) $3x^2+2y^2-z=15$, $(2,2,5)$

b) $x^2+y^2=5$, $(2,1,3)$

6) Find the point(s) on the surface at which the tangent plane is horizontal.

a) $z=3-x^2-y^2+6y$

b) $z=5xy$

7) Show that the surfaces $x^2+2y^2+3z^2=3$ and $x^2+y^2+z^2+6x-10y+14=0$ are tangent to each other at the point $(-1,1,0)$ by showing that the surfaces have the same tangent plane at this point.

8) Show that the surfaces $z=2xy^2$ and $8x^2-5y^2-8z=-13$ intersect at the point $(1,1,2)$, and show that the surfaces have perpendicular tangent planes at this point.

9) Find the point on the hyperboloid $x^2+4y^2-z^2=1$ where the tangent plane is parallel to the plane $x+4y-z=0$.

10) Find parametric equations for the tangent line to the curve of intersection of the paraboloid $z=x^2+y^2$ and the ellipsoid $4x^2+y^2+z^2=9$ at the point $(-1,1,2)$.