CROSS-SECTIONS AND TANGENTS - ANSWERS

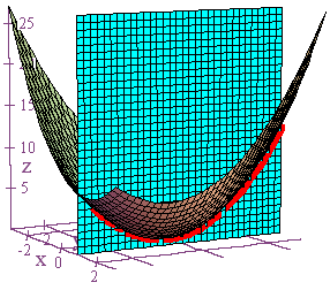
1. Let $z = f(x,y) = x^2 + xy + y^2$. Find parametric equations for the cross-section of $z = f(x,y) = x^2 + xy + y^2$ with the plane $x = 1$.

$x = 1$

$y = t$

$z = 1 + t + t^2$

$-\infty < t < \infty$



2. Let $z = f(x,y) = x^2 + xy + y^2$, and let $P = (1,2,7)$. Find parametric equations for the line that is tangent to $z = f(x,y) = x^2 + xy + y^2$ at the point $P = (1,2,7)$ and that lies in the plane $x = 1$.

$z = 1 + y + y^2$

$z' = 1 + 2y$

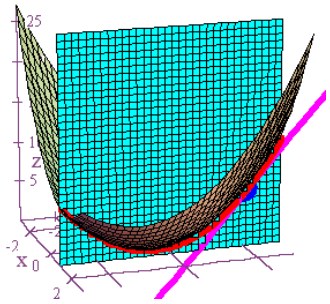
$z'(2) = 5$

$x = 1$

$y = 2 + t$

$z = 7 + 5t$

$-\infty < t < \infty$



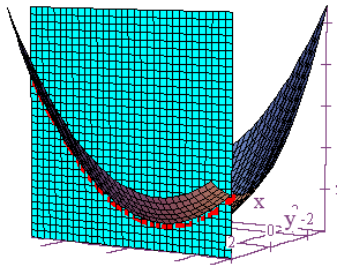
3. Let $z = f(x,y) = x^2 + xy + y^2$. Find parametric equations for the cross-section of $z = f(x,y) = x^2 + xy + y^2$ with the plane $y = 2$.

$x = t$

$y = 2$

$z = t^2 + 2t + 4$

$-\infty < t < \infty$



4. Let $z = f(x,y) = x^2 + xy + y^2$, and let $P = (1,2,7)$. Find parametric equations for the line that is tangent to $z = f(x,y) = x^2 + xy + y^2$ at the point $P = (1,2,7)$ and that lies in the plane $y = 2$.

$z = x^2 + 2x + 4$

$z' = 2x + 2$

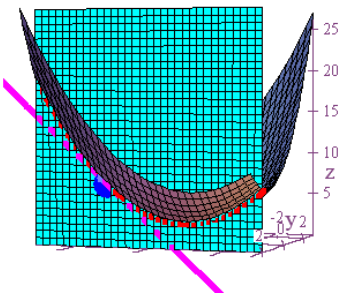
$z'(1) = 4$

$x = 1 + t$

$y = 2$

$z = 7 + 4t$

$-\infty < t < \infty$



5. Find an equation for the plane that is tangent to $z = f(x,y) = x^2 + xy + y^2$ at the point $P = (1,2,7)$. Write your answer in the form $z = Ax + By + C$.

$m_x = 4,\ m_y = 5$

$z = 4x + 5y + C$

$7 = 4(1) + 5(2) + C \Rightarrow 7 = 14 + C \Rightarrow C = -7$

$z = 4x + 5y - 7$