

CROSS-SECTIONS AND TANGENTS - ANSWERS

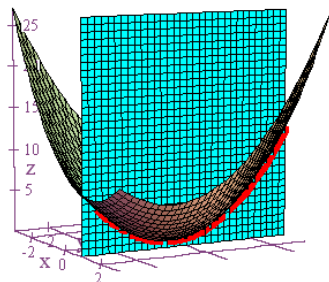
1. Let $z = f(x, y) = x^2 + xy + y^2$. Find parametric equations for the cross-section of $z = f(x, y) = x^2 + xy + y^2$ with the plane $x = 1$.

$$x = 1$$

$$y = t$$

$$z = 1 + t + t^2$$

$$-\infty < t < \infty$$



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 $x = 1$.

$$z = 1 + y + y^2$$

$$z' = 1 + 2y$$

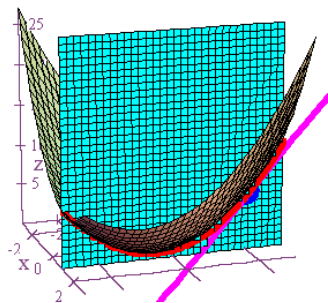
$$z'(2) = 5$$

$$x = 1$$

$$y = 2 + t$$

$$z = 7 + 5t$$

$$-\infty < t < \infty$$



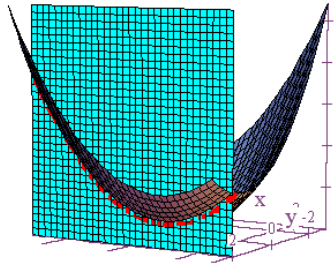
3. Let $z = f(x, y) = x^2 + xy + y^2$. Find parametric equations for the cross-section of $z = f(x, y) = x^2 + xy + y^2$ with the plane $y = 2$.

$$x = t$$

$$y = 2$$

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

$$-\infty < t < \infty$$



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 $y = 2$.

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

$$z' = 2x + 2$$

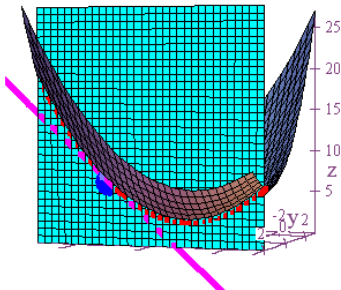
$$z'(1) = 4$$

$$x = 1 + t$$

$$y = 2$$

$$z = 7 + 4t$$

$$-\infty < t < \infty$$



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 $z = Ax + By + C$.

$$m_x = 4, m_y = 5$$

$$z = 4x + 5y + C$$

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

$$z = 4x + 5y - 7$$

