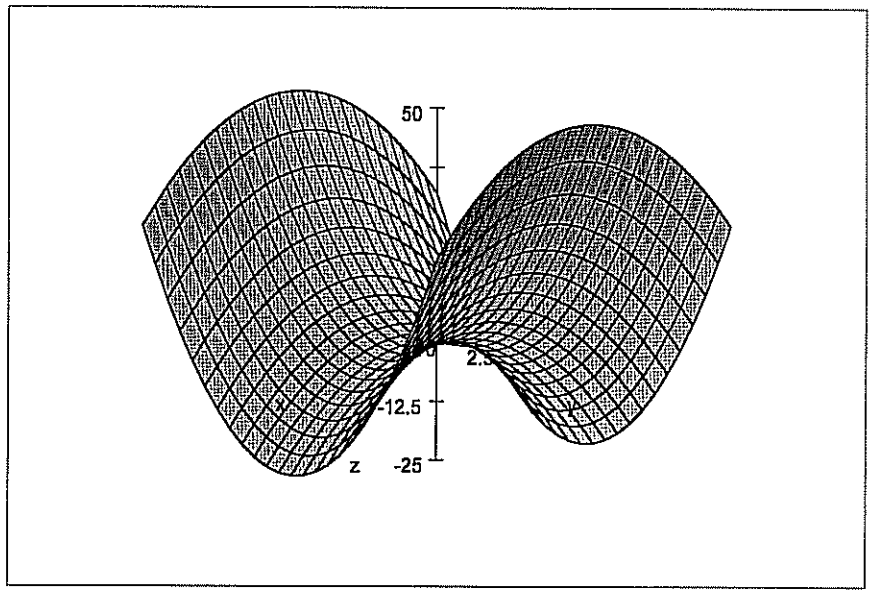
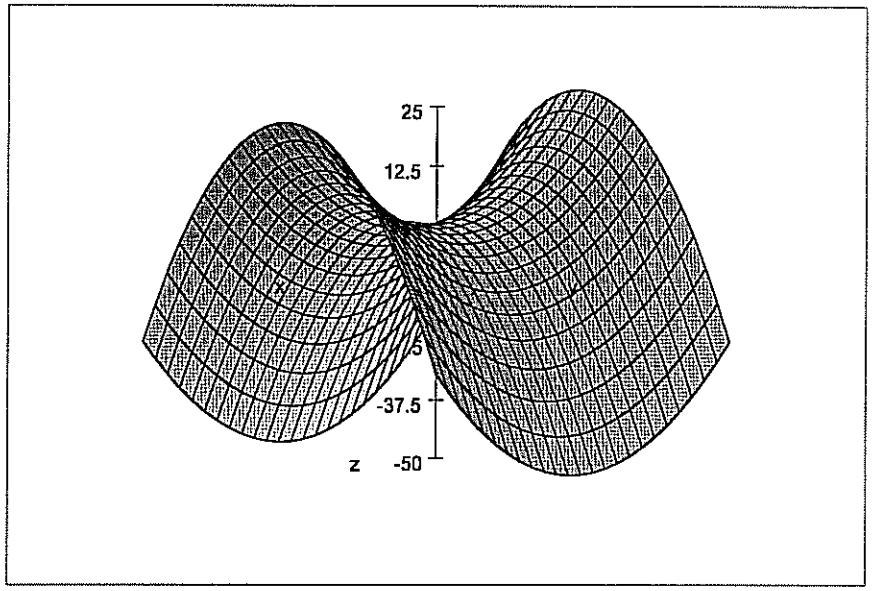
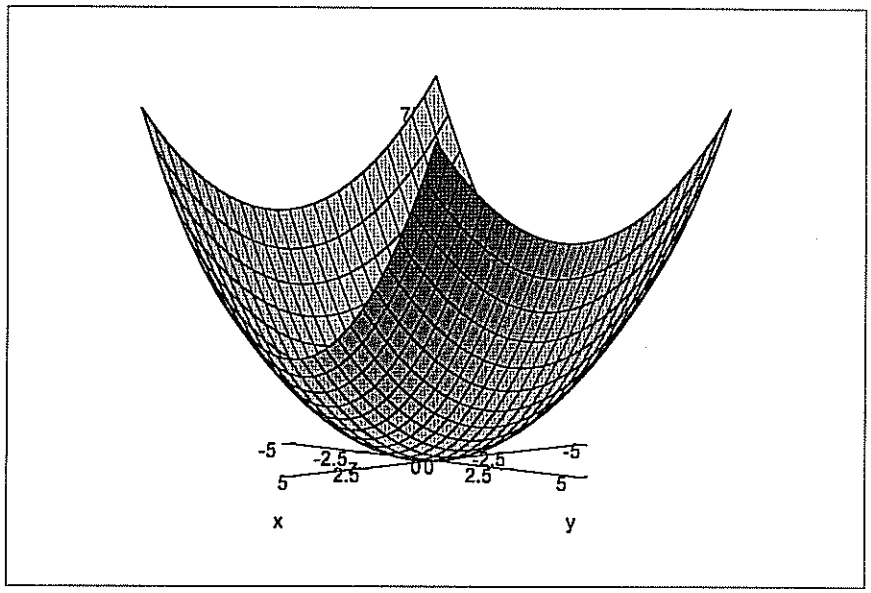


$z = -x^2 + 2y^2$

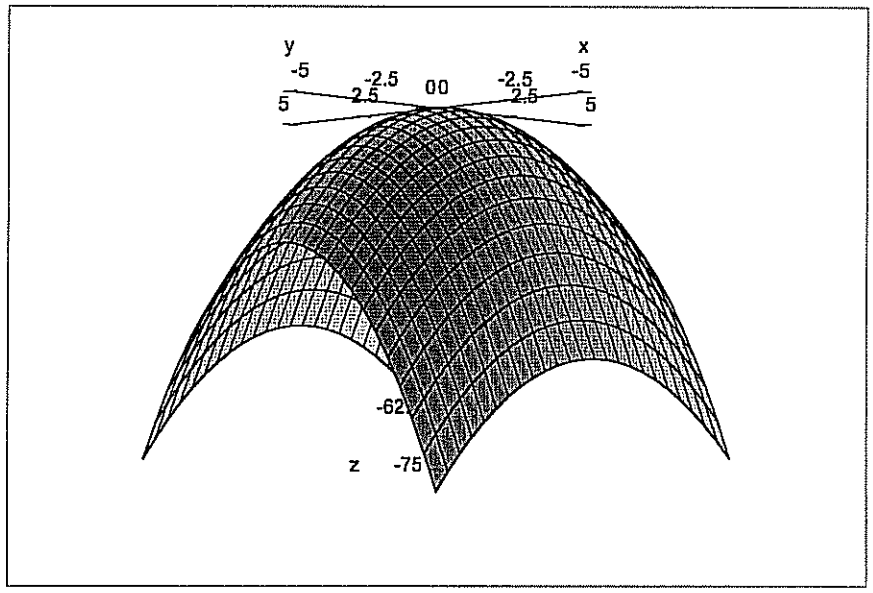


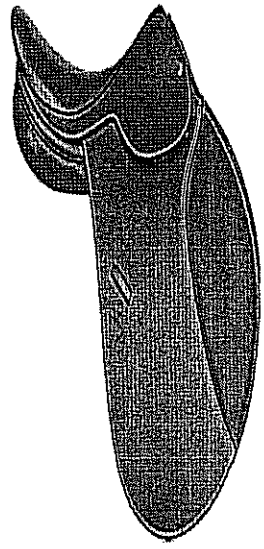
$z = x^2 - 2y^2$

These pictures, again the second is just the first turned upside down, are model examples of a phenomenon that doesn't happen with functions of one variable. For the first graph the origin looks like a local max if y is set to 0 and x varies. On the other hand, if x is set to zero and y varies the origin looks like a local min. This is because the x^2 and y^2 terms have opposite sighs. The same happens in the second picture but the roles of x and y are reversed.



$z = x^2 + 2y^2$



$z = -x^2 - 2y^2$

For functions of one variable the upward opening parabola $y = x^2$ and the downward opening parabola $y = -x^2$ are model examples or local min and local max. These are the analogous examples for functions of two variables. Notice that the second picture is just the first one turned upside down (value for z multiplied by -1)