SECOND PARTIALS TEST

For each of the functions below, find the critical points and the determinant of the second partials matrix, and classify each critical point as resulting in a local maximum, local minimum, saddle point, or inconclusive. Furthermore, for each critical point (a,b), specify the coordinates $(a,b,f(a,b))$.

1. $z = f(x,y) = x^2 + y^2$

2. $z = f(x,y) = x^2 - y^2$

3. $z = f(x,y) = -\left(x^2 + y^2\right)$

4. $z = f(x,y) = x^3 - 6x + y^3 - 9y$

5. $z = f(x,y) = x^3 - 12xy - y^4$