Nonplanar (cylindrical and spherical) Gardner solitons (GSs) and double layers (DLs) in a plasma (composed of inertial positive and negative ions, and nonthermal electrons) are studied by employing the reductive perturbation method. The modified Gardner (MG) equation describing the nonlinear propagation of the ion-acoustic (IA) waves is derived, and its nonplanar Gardner soliton and double layer solutions are numerically analyzed. It has been found that the basic characteristics of the IA GSs, which are shown to exist for $\alpha$ around its critical value $\alpha_c$ [where $\alpha$ is the nonthermal parameter, $\alpha_c$ is the value of $\alpha$ corresponding to the vanishing of the nonlinear coefficient of the Korteweg-de Vries (K-dV) equation], are different from those of the K-dV solitons, which do not exist for $\alpha$ around $\alpha_c$. The parametric regimes for the existence of the DLs, which are found to be associated with negative potential only, are obtained. The basic features of nonplanar IA GSs and IA DLs, which are found to be different from planar ones, are also identified. The implications of our results to different space and laboratory plasma situations, where opposite polarity ions are observed, are discussed.