İzmir University of Economics, Department of Mathematics

MATH 205 ANALYTIC GEOMETRY **Mid-Term Exam** 29.12.2003

**Name** **Student No.**

1. For each item, write down the corresponding conic equation from the given values

   (a) A point $(x, y)$ on the *parabola* with focus $(h, k + p)$ and directrix $y = k - p$,

   (b) A point $(x, y)$ on the *ellipse* with center $(h, k)$, vertices $(h, k \pm a)$ and covertices $(h \pm b, k)$ where $c^2 = a^2 - b^2$,

   (c) A point $(x, y)$ on the *hyperbola* with center $(h, k)$, vertices $(h, k \pm a)$, and foci $(h, k \pm c)$ where $c^2 = a^2 + b^2$.

2. For each item in the above question, write down the related *foci, eccentricity* and *directrices* wherever applicable.

3. Show that the circle centered at $(h, k)$ with radius $r$ is *invariant* (unchanged) under rotation transformation. (Hint: How about using translation and rotation equations?)

4. Find the length of the *astroid* curve

$$x = \cos^3 t, \qquad y = \sin^3 t \qquad 0 \leqslant t \leqslant 2\pi.$$

5. Draw the graph of the conic

$$5x^2 + 4xy + 2y^2 - 24x - 12y + 18 = 0,$$

and find *center, foci,vertices, eccentricity, directrix* of the new graph.