

Worksheet 4, Math H53

Quadratic Functions, Curves, Surfaces I

Thursday, February 7, 2013

1. Find the vertex, focus, and directrix of the parabola described by $y^2 + 2y + 12x + 25 = 0$, and sketch its graph.
2. Find the vertices and foci of the ellipse described by $9x^2 - 18x + 4y^2 = 27$, and sketch its graph.
3. Find the vertices, foci, and asymptotes of the hyperbola described by $4x^2 - y^2 - 24x - 4y + 28 = 0$, and sketch its graph.
4. Identify the type of the conic section described by the equation $y^2 - 8y = 6x - 16$, and find the vertices and foci.
5. Find an equation for the parabola which has a horizontal axis, and passes through the points $(-1, 0)$, $(1, -1)$, and $(3, 1)$.
6. Describe and sketch the surface given by $z = 1 - y^2$.
7. Reduce the equation
$$x^2 - y^2 + z^2 - 4x - 2y - 2z + 4 = 0$$
to one of the standard forms, classify the surface, and sketch it.
8. Show that the function defined by the upper branch of the hyperbola $y^2/a^2 - x^2/b^2 = 1$ is concave upward.
9. Show that the tangent lines to the parabola $x^2 = 4py$ drawn from any point on the directrix are perpendicular.
10. Find an equation for the surface obtained by rotating the parabola $y = x^2$ about the y -axis.
11. Find an equation for the surface consisting of all points that are equidistant from the point $(-1, 0, 0)$ and the plane $x = 1$. Identify the surface.