

MATH 381 W 2010

ASSIGNMENT 1

1. Sketch the parabola $y^2 = 4x$, $y \geq 0$, or equivalently $y = 2\sqrt{x}$. Let $F = (1, 0)$, show that F is the focal point. To do this first show that $y' = 2/y$. Next, let $P = (b^2/4, b)$ be any fixed point on the parabola. Let $\mathbf{v} = \langle 1, 0 \rangle$ be the unit vector at P that is horizontal and directed to the right. Show that the vector $\mathbf{w} = \langle 1, 2/b \rangle$ is tangent to the parabola at P and also pointing towards the right. Let θ be the angle between these two vectors, use the scalar product to show $\cos \theta = b/\sqrt{b^2 + 4}$. Similarly show that if ϕ is the angle between the two vectors $-\mathbf{w}$ and $\mathbf{x} = PF$, then $\cos \phi = b/\sqrt{b^2 + 4}$. Conclude that $\phi = \theta$ and thus that F is the focal point of the parabola.
2. Adams 10.2 : 1(g),3,4,7,14,23,27. Also in 14 find the angle between two diagonals of the cube.
3. Adams 10.3 : 22,23,25 (the Jacobi identity)
4. Adams 10.4 : 5,7,15,17
5. Adams 10.5 : 1 - 11 (odds), 21
6. Adams 10.6 : 3,5,6,7,8
7. Marsden - Tromba p. 86 : 2,4,7,10,11,12 (photocopies of these available for those who do not have this text)