

**Quiz #1**

Monday 17 September 2001 (25 minutes)

Consider a particle that moves along an ellipse,  $x^2/a^2 + y^2/b^2 = 1$  ( $a > b$ ). Let the speed of the particle be a constant  $v$ .

1. (10 points) State and qualitatively justify where on the elliptical path the magnitude of the particle's acceleration achieves its maximum and minimum.
2. (30 points) Compute the maximum and minimum of the magnitude of the particle's acceleration. To do so, you will need the radius of curvature of the elliptical path. Express the ellipse in terms of two parametric equations:  $x=x(t)$ ,  $y=y(t)$ , and then compute the radius of curvature of using the formula:  $\rho = \{[x'(t)]^2 + [y'(t)]^2\}^{3/2} / [x'(t)y''(t) - x''(t)y'(t)]$ . Note that the parameter  $t$  here is purely geometric in nature, which may or may not be the time variable.

