Homework 1 (sects C & D)
Due Friday July 9th

July 1, 2004

Exercise 1. Compute the following limits:

$$\lim_{\theta \to 0} \frac{\theta^2}{\sin \theta} \qquad \lim_{x \to 0} \frac{\sqrt{1+x} - \sqrt{1-x}}{x} \tag{1}$$

Exercise 2. How many tangent lines to the curve $y = \frac{x}{x+1}$ pass through the point $(1, 2)$?. At which points do these tangent lines touch the curve?.

Exercise 3. A manufacturer of cartridges for stereo systems has designed a stylus with parabolic cross-section. The equation of the parabola is $y = 16x^2$ where x and y are measured in millimeters. If the stylus sits in a record groove whose sides make an angle of θ with the horizontal direction, where $\tan \theta = 1.75$ find the points of contact P and Q of the stylus with the groove.

Exercise 4. A spherical balloon is being inflated. Find the rate of increase of the surface area ($S = 4\pi r^2$) with respect to the radius r when r is $1ft$.

Exercise 5. Find the equation of the tangent line to the curve

$$\frac{x^2}{9} + \frac{y^2}{36} = 1 \tag{2}$$

at the point $(-1, 4\sqrt{2})$. Note that the curve is an ellipse.