Math Xb Spring 2004
Worksheet: Solving Trigonometric Equations
March 8, 2004

1. Simplify each of the following to an expression that does not involve trig functions or inverse trig functions.

   (a) $\sin^{-1}\left(-\frac{\sqrt{2}}{2}\right)$

   (b) $\tan^{-1}\sqrt{3}$

   (c) $\cos\left(\cos^{-1}.7\right)$

   (d) $\tan^{-1}(\tan\pi)$

   (e) $\tan\left(\sin^{-1}(a)\right)$

   (f) $\tan\left(\sin^{-1}(-a)\right)$

2. Many animal populations, such as that of rabbits, fluctuate over ten-year cycles. Suppose that the number of rabbits at time t (in years) is given by

$$N(t) = 1000\cos\left(\frac{\pi}{5}t\right) + 4000.$$

   For what values of t between 0 and 10 does the rabbit population equal 4500?

3. For each of the following equations, find all solutions in the interval specified. Give exact answers like $\frac{\pi}{4}$ as opposed to numerical approximations like 0.7854.

(a) $2\cos^2 t + 3\cos t + 1 = 0$ for $t \in [0, 2\pi]$

(b) $\sin x - \cos x = 0$ for $x \in [0, 2\pi]$

(c) $\cos\left(2x - \frac{\pi}{4}\right) = 0$ for $x \in [-2\pi, 2\pi]$

(d) $4\sin^2 x \tan x = \tan x$ for $x \in (-\infty, \infty)$