Homework 9

This homework is due in class on Friday 11/3/11

1   Course material

Properties of exponential and logarithmic functions:

- Textbook Section 5.4: 42, 44, 46, 48, 52, 54, 56, 58, 60, 70, 76, 78 (Hint: use change of base to the natural logarithm), 82

Solving equations with exponentials and logarithms

- Textbook Section 5.5: 2, 4, 6, 8, 10, 32, 40, 80, 82, 84

Basic trigonometric functions

In the following figure, complete the missing angles. Give the sine, cosine, tangent, co-tangent, secant and cosecant of each angle.
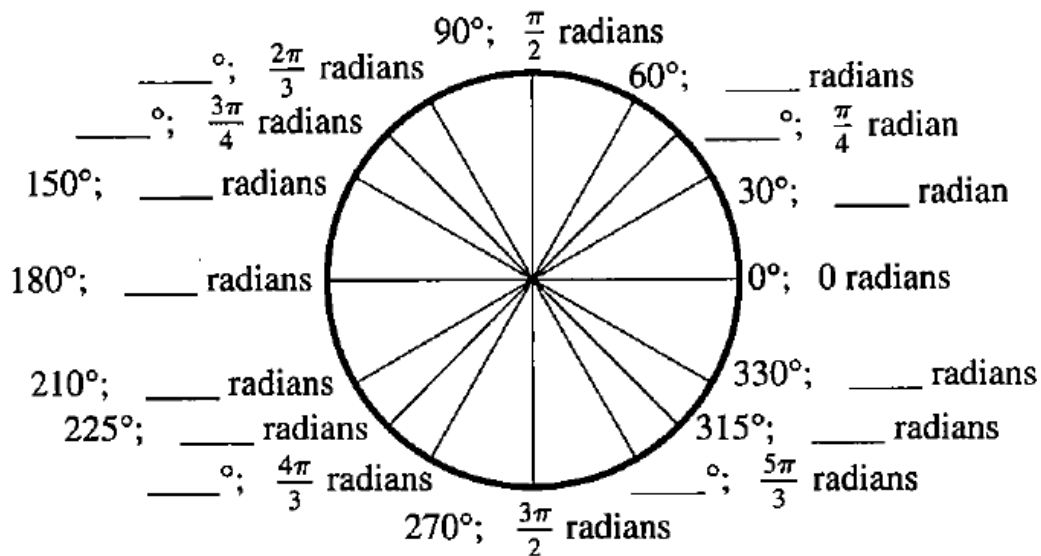
Write your answers in a table as in the following example: where ND stands for Not Defined.

Degrees	Radian	cos	sin	tan	cotan	sec	cosec
0	0	1	0	0	ND	1	ND

2 Applied Problems

(Based on Textbook Section 5.7)

The world population around 1975 was growing at a rate of about 1.75% per year (Note: this means that if there are 100 persons in one year, there are 101.75 persons in the next year). In 1975 exactly, the US Bureau of the Census estimated the world population to be 4.088 billion.

Question 1: Given this information estimate the total world population in 1974, 1976 and 1977.

Question 2: Generalize your finding to express your estimate of the world population at year t as the function
$$N(t) = N_0 a^{t-1975}$$
What is the value of N_0? What is valueof a?

Question 3: According to this estimate, what should be the world population in 2009? (Note that the current population is about 6.799 billion, showing that the growth rate has slowed down a little since 1975).

Question 4: Using a change of base formula, express the function $N(t)$ as the following exponential in base e:
$$N(t) = N_0 e^{r(t-1975)}$$
What is value of r?

Question 5: How long does it take for the population to double? (Hint: find the time t for which $N(t) = 2N_0$).

Question 6: Using the exponential in base e formula, estimate the population at the year 0.

Question 7: The answer in question 6 doesn't make much sense. Discuss what could be wrong about assuming that the world population evolves according to the formula in Question 2 (or 4).