First name: ___________ Last name: ____________ Student ID: ______________

Trigonometric Functions (1) Homework

1. Simplify and Express the following in terms of $\tan\theta$. Leave the answers in the simplest form.

a) $\dfrac{\sin^2\theta}{\cos^2\theta}+7\tan^2\theta$	b) $\sqrt{\dfrac{1-\sin^2\theta}{1-\cos^2\theta}}$	c) $\dfrac{1}{\sin^2\theta}-1$

2. Prove that each of the following is an identity.

a) $\sec\theta(1-\cos\theta)=\sec\theta-1$	b) $\sin^2\alpha\sec^2\alpha=\sec^2\alpha-1$
c) $\dfrac{\sin\theta}{\csc\theta}+\dfrac{\cos\theta}{\sec\theta}=1$	d) $\dfrac{\sin x\cos x}{\tan x}=1-\sin^2 x$

e) $\sin^4\alpha - \cos^4\alpha = 1 - 2\cos^2\alpha$	f) $\cos^2 x + \dfrac{\sin x\cos x}{\tan x} = 2\cos^2 x$
g) $\dfrac{1+\cos x}{\sin x} = \dfrac{\sin x}{1-\cos x}$	h) $\dfrac{\tan x}{1+\tan x} = \dfrac{\sin x}{\sin x + \cos x}$
i) $\dfrac{\cos^2 x}{1+2\sin x - 3\sin^2 x} = \dfrac{1+\sin x}{1+3\sin x}$	j) $(\sin x - \cos x)^2 = 1 - 2\sin x\cos x$

k) $\dfrac{\sin^2 x + 2\cos x - 1}{\sin^2 x + 3\cos x - 3} = \dfrac{\cos^2 x + \cos x}{-\sin^2 x}$	l) $\sin^2 \beta - \cos^2 \beta - \tan^2 \beta = \dfrac{2\sin^2 \beta - 2\sin^4 \beta - 1}{1 - \sin^2 \beta}$

3. Solve each of the following equations. Give exact answers only ($0 \le x \le 360^0$).

a) $\sin^2 2x = 1$	b) $2\cos^2 x = 1$
c) $\cos x - \sin x = 0$ [Hint: $\tan x = \dfrac{\sin x}{\cos x}$]	d) $\sin^2 x - \cos^2 x = 0$

e) $\sin^2 x + 2\sin x = -1$	f) $2\sin^2 x - \sin x - 1 = 0$
g) $2\cos^2 x + 5\cos x - 3 = 0$	h) $3 - 3\sin x - 2\cos^2 x = 0$

4. The temperature of a patient during a 9-day illness is given by $T(t) = 39.1 + 2.1 \sin(30t)$, where t is the number of days from the start of the illness, and $T(t)$ is the patient's temperature, in degrees Celsius.

a) Does the patient's temperature reach 41°C? If so, on what day?

b) What is the patient's temperature at the end of the illness?