PRECALCULUS PROBLEM SESSION #11 SOLUTIONS

Inverse Trigonometric Functions

1. a) $\pi/3$ b) $-\pi/3$ c) 0 d) $-\pi/6$ 2. a) $2\pi/3$ b) $2\pi/3$ c) $-\pi/4$

Because the range of $\sin^{-1}(x)$ is $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$.

- 4. a) 12/5 b) $\frac{2\sqrt{3}}{3}$
- 5. (a) $\sqrt{1-4x^2}$ (b) x
- 6. The ranges of some inverse trigonometric functions are restricted: $\sin^{-1} x$, $\cos^{-1} x$, $\csc^{-1} x$ and $\sec^{-1} x$. This is because the domains of the corresponding trigonometric functions are restricted, in order for them to become one-to-one functions, so that they may have inverses, and since the domain of a function becomes the range of the inverse, it follows that the ranges of these inverse functions are restricted.

Applications of Trigonometric Functions

- 1. C = 90°, B = 48.5°, a = 17.6945, c = 26.7038
- 2. $-8\cos(\pi t)$

3.

- 3. a) 8 inches b) ¹/₄ cycle per second c) The time required for one cycle is 4 seconds.
 4. The height of the building is approximately 24 feet.
- 5. The stolen car is approximately 260 feet from a point directly below the helicopter.
- 6. The angle of elevation of the sun is approximately 80.9° .
- 7. The height of the flagpole is approximately 209.8 feet.

Verifying Trigonometric Identities

 $1. \qquad \cos^2 x + \sin^2 x = 1$

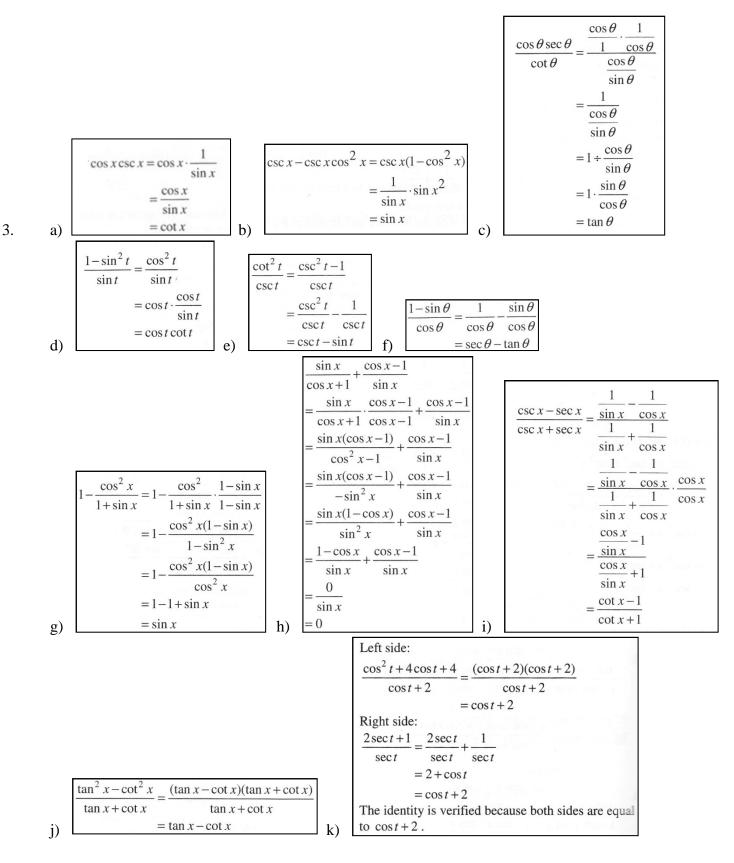
$$\frac{\cos^2 x}{\cos^2 x} + \frac{\sin^2 x}{\cos^2 x} = \frac{1}{\cos^2 x} \Longrightarrow 1 + \tan^2 x = \sec^2 x$$

$$\frac{\cos^2 x}{\sin^2 x} + \frac{\sin^2 x}{\sin^2 x} = \frac{1}{\sin^2 x} \Longrightarrow \cot^2 x + 1 = \csc^2 x$$

2. A trigonometric equation that is an identity is ALWAYS true, while a trigonometric equation that is not an identity is only true for certain values of the variable.

 $\cos^2 x + \sin^2 x = 1$ is always true, while $\cos x = \frac{1}{2}$ is sometimes true.

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Sum and Distance Formulas

1.	a) $\frac{\sqrt{2}+\sqrt{6}}{4}$ b	$) \qquad \frac{\sqrt{2}-\sqrt{6}}{4} c)$	$-2 - \sqrt{3}$
2.	a) $\frac{\sqrt{3}}{3}$ b)) 1	
3.	$cos(\alpha + \beta) + cos(\alpha - \beta)$ = cos \alpha cos \beta - sin \alpha sin \beta + cos \alpha cos \beta + sin \alpha sin \beta = 2 cos \alpha cos \beta		
4.	Part a) a) -4/5 b)) -3/5	c) 3/4

Part b)

a)
$$\frac{-6-4\sqrt{5}}{15}$$
 b) $\frac{8-3\sqrt{5}}{15}$ c) $\frac{54-25\sqrt{5}}{22}$