1. Find all six trigonometric functions of θ if $(3,\sqrt{7})$ is on the terminal side of θ .

2. If $\sec\theta = -3$ and the terminal side of θ is in quadrant II, find

   a) $\tan\theta$

   b) $\csc\theta$

.

3. Give the **exact** values of:

   a) $4\cos\left(-\frac{3\pi}{4}\right)$

   b) $\csc\left(\frac{11\pi}{6}\right)$

4. A rectangular swimming pool is three feet deep at the shallow end of the pool. The bottom of the pool has a steady downward drop of 12°. If the pool is 50 feet long, how deep is it at the deep end?

5. In ΔABC $C = 90^\circ$, $A = 30^\circ$, and side $b = \sqrt{8}$ cm. Find exact values for the lengths of the following.

   a) side a

   b) side c

6. Simplify completely: $(\csc x + \cot x)(1 - \cos x)$

7. Find the exact value of:

a) $\cos\left[\tan^{-1}\left(\frac{\sqrt{5}}{2}\right)\right]$

b) $\sin^{-1}\left(\sin\frac{5\pi}{6}\right)$

8. Prove: $(\tan\theta - \sec\theta)^2 = \frac{1-\sin\theta}{1+\sin\theta}$

9. Find the **amplitude**, **period**, and **phase shift** of: $y = 5\sin\left(\frac{\pi}{2}x + \pi\right)$

10. Sketch one complete period of $y = 2\cos \pi x$

11. If $x = a\tan\theta$, $-\frac{\pi}{2} \le \theta \le \frac{\pi}{2}$ and $a > 0$, express $\sqrt{a^2 + x^2}$ in terms of a trig function of θ .

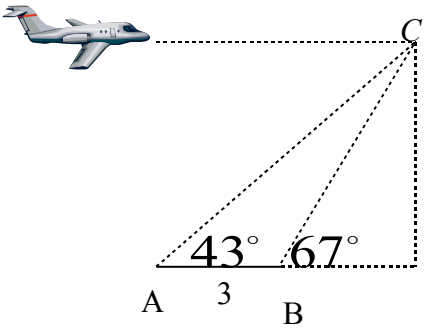
12. Let $\tan A = \frac{3}{2}$ where $\pi \le A \le \frac{3\pi}{2}$. Find $\tan\frac{A}{2}$ and simplify your answer.

13. Find all solutions in the interval $[0, 2\pi)$ for: $\tan^2 x \sin x = \sin x$.

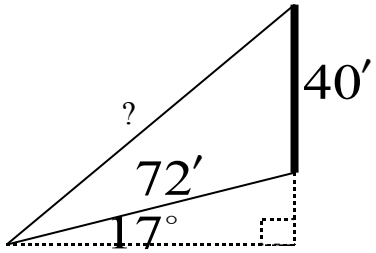
14. Find the resulting equation when the parameter t is eliminated from the equations $x = 3 + 2\sec t$ and $y = 2 + 4\tan t$.

15. In triangle ABC, if $\angle A = 67^\circ$, $a = 100$ cm., and $c = 125$ cm, determine if angle C exists. If so, find all possible measures of angle C. If not, explain why.

16. A plane flying in a straight line passes directly over point A on the ground and later directly over point B, which is three miles from A. A few minutes after the plane passes over B, the angle of elevation from A to the plane is 43° and the angle of elevation from B to the plane is 67°. How high is the plane at that moment?



17. A vertical pole 40 feet tall stands on a hillside that makes an angle of 17° with the horizontal. Approximate the shortest length of cable that will reach from the top of the pole to a point 72 feet downhill from the base of the pole.



18. A vector, $\mathbf{V}$, has magnitude $\|\mathbf{V}\|$ and forms an angle q with the positive x-axis. Find the magnitudes of $\|\mathbf{V}_x\|$ and $\|\mathbf{V}_y\|$ if $\|\mathbf{V}\| = 900$ and $q = 16^\circ$.

19. Find $\left(-\sqrt{3}+i\right)^5$. Express your answer in the form $a+bi$.

20. Find the fourth roots of $-8-8i\sqrt{3}$

Math 104 Common Final Exam
Spring 2007

Name:_____

Date:_____ **Major:**_____

NO GRAPHING CALCULATORS. SHOW ALL YOUR WORK ON THE EXAM. BOX YOUR FINAL ANSWERS.

1_____ **13**_____

2_____ **14**_____

3_____ **15**_____

4_____ **16**_____

5_____ **17**_____

6_____ **18**_____

7_____ **19**_____

8_____ **20**_____

9_____ **Total**_____

10_____

11_____ **Grade**_____

12_____

Formulas:

Nth roots formula: $w_k = \sqrt[n]{r}\left[\cos\left(\frac{\theta + 2\pi k}{n}\right) + i\sin\left(\frac{\theta + 2\pi k}{n}\right)\right] \quad k = 0,1,2,\ldots,n-1$

$\sin 2A = 2\sin A\cos A$

$\cos 2A = \cos^2 A - \sin^2 A$

$2\cos^2 A - 1$

$1 - 2\sin^2 A$

$\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$

$\sin\frac{A}{2} = \pm\sqrt{\frac{1 - \cos A}{2}}$

$\cos\frac{A}{2} = \pm\sqrt{\frac{1 + \cos A}{2}}$

$\tan\frac{A}{2} = \frac{1 - \cos A}{\sin A} = \frac{\sin A}{1 + \cos A}$