Trigonometry Formulas

$$\sin(u+v) = \sin u \cos v + \cos u \sin v$$

$$\cos(u+v) = \cos u \cos v - \sin u \sin v$$

$$\tan(u+v) = \frac{\tan u + \tan v}{1 - \tan u \tan v}$$

$$\sin(u-v) = \sin u \cos v - \cos u \sin v$$

$$\cos(u-v) = \cos u \cos v + \sin u \sin v$$

$$\tan(u-v) = \frac{\tan u - \tan v}{1 + \tan u \tan v}$$

$$\sin^2 \frac{u}{2} = \frac{1 - \cos u}{2}$$

$$\cos^2 \frac{u}{2} = \frac{1 + \cos u}{2}$$

$$\sin 2u = 2 \sin u \cos u$$

$$\begin{aligned} \cos 2u &= \cos^2 u - \sin^2 u \\ &= 1 - 2\sin^2 u \\ &= 2\cos^2 u - 1 \end{aligned}$$

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

$$\sin a + \sin b = 2 \sin \frac{a+b}{2} \cos \frac{a-b}{2}$$

$$\sin a - \sin b = 2 \cos \frac{a+b}{2} \sin \frac{a-b}{2}$$

$$\cos a + \cos b = 2 \cos \frac{a+b}{2} \cos \frac{a-b}{2}$$

$$\cos a - \cos b = -2 \sin \frac{a+b}{2} \sin \frac{a-b}{2}$$

Trigonometry, MATH 150 NAME _____

Thursday, March 10, 2005 Rec. Instr. _____

Exam 2 Rec. Hour _____

Work as many of the following problems as you can. To assure partial credit, <u>show your work</u>. No calculators are permitted for this exam.

(10 pts) 1. Two boats leave the harbor at the same time; the red one at a bearing of S25°W, at a speed of 10 miles per hour, and the green one at a bearing of S65°E, at a speed of 14 mph. After an hour and a half, sailing at a steady course, what is the bearing from the red boat to the green one? [Begin by drawing a diagram, labelling it with the information at hand.]

(24 pts) 2. Find <u>all</u> the solutions, with perfect accuracy, to the following equations.

a) $\tan\theta = -1$

b) $\sin\left(t - \frac{\pi}{4}\right) = -\frac{\sqrt{3}}{2}$

c) $\cos 3x = \frac{1}{2}$

d) $\sin(-u) = \frac{1}{2}$

(30 pts) 3. Find all the solutions in $[0, 2\pi)$ to the following equations.

a) $2\cos^2 x - 5\cos x + 2 = 0$
[Hint: Try factoring the given expression.]

b) $\cos 3x - \cos x = 0$

c) $\tan^2 2t = 3$

(36 pts) 4. Find the exact value of each of the following expressions.

a) $\sin\left(\frac{5\pi}{12}\right)$

b) $\cos\left(\frac{\theta}{2}\right)$, given that $\sin\theta = \frac{-3}{5}$ and that θ is a quad III angle in standard position.

c) $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$

d) $\sin\left(\sin^{-1}\left(\frac{3}{17}\right)\right)$

e) $\sin\left(\cos^{-1}\left(\frac{3}{5}\right)\right)$

f) $\cos\left(\cos^{-1}\left(\frac{3}{5}\right) + \sin^{-1}\left(\frac{3}{5}\right)\right)$