Math 51 (7:30am – 8:20am) BROWN
Midterm 1
Thu Apr 23, 2009

SCORE: ___ / 140 POINTS

What month is your birthday ? ___ ___
What are the first 2 digits of your address ? ___ ___
What are the last 2 digits of your zip code ? ___ ___
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NO CALCULATORS ALLOWED ON THIS SECTION

Find the six trigonometric function values for an angle in standard position with terminal side $3x+4y=0, \quad x \le 0$. **SHOW YOUR WORK.** SCORE: ___ / 10 POINTS

$3(-4)+4(3)=0$

$x=-4$
$y=3$
$r=\sqrt{(-4)^2+3^2}$
$=5$

$\sin\theta=\frac{3}{5}$ $\quad \csc\theta=\frac{5}{3}$
$\cos\theta=-\frac{4}{5}$ $\quad \sec\theta=-\frac{5}{4}$
$\tan\theta=-\frac{3}{4}$ $\quad \cot\theta=-\frac{4}{3}$

Use an identity **(NOT x, y and r)** to find $\cot\theta$ if $\csc\theta=6$ and $\sec\theta<0$. **SHOW YOUR WORK.** SCORE: ___ / 6 POINTS

$\csc^2\theta=\cot^2\theta+1$
$36=\cot^2\theta+1$
$\cot^2\theta=35$
$\cot\theta=\pm\sqrt{35}$

θ IN $Q_2 \Rightarrow \cot\theta<0$
$\cot\theta=-\sqrt{35}$

Fill in the following values. SCORE: ___ / 6 POINTS

[a] $\tan 30^\circ = \frac{\sqrt{3}}{3}$ [b] $\sec 60^\circ = 2$ [c] $\sin 45^\circ = \frac{\sqrt{2}}{2}$

[d] $\csc 60^\circ = \frac{2\sqrt{3}}{3}$ [e] $\cot 45^\circ = 1$ [f] $\cos 30^\circ = \frac{\sqrt{3}}{2}$

Complete the following table of values for the quadrantal angle -90°. SCORE: ___ / 6 POINTS

θ	$\sin\theta$	$\cos\theta$	$\tan\theta$	$\csc\theta$	$\sec\theta$	$\cot\theta$
-90°	-1	0	UNDEF	-1	UNDEF	0

MULTIPLE CHOICE: Which of the following statements is true ? SCORE: ___ / 6 POINTS

[a] $\csc 43^\circ < \csc 46^\circ$ [b] $\sin 43^\circ > \cos 46^\circ$ [c] $\tan 43^\circ > \tan 46^\circ$ [d] none of the above

LETTER OF CORRECT ANSWER: D

Find one solution for the equation $\sec(3\alpha - 20^\circ) = \csc(2\alpha - 10^\circ)$. **SHOW YOUR WORK.** **SCORE: ___ / 10 POINTS**

$3\alpha - 20^\circ = 90^\circ - (2\alpha - 10^\circ)$

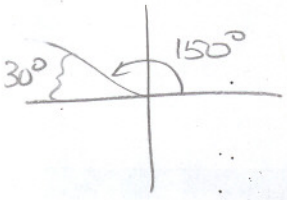
$3\alpha - 20^\circ = 100^\circ - 2\alpha$

$5\alpha = 120^\circ$

$\alpha = 24^\circ$

Find the six trigonometric function values for 870°. **SHOW YOUR WORK.** **SCORE: ___ / 10 POINTS**

$870^\circ - 360^\circ \times 2 = 150^\circ$ IN Q_2

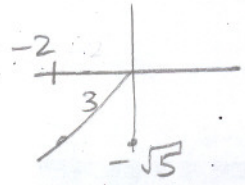


$\sin\theta = \frac{1}{2}$ $\quad \csc\theta = 2$

$\cos\theta = -\frac{\sqrt{3}}{2}$ $\quad \sec\theta = -\frac{2\sqrt{3}}{3}$

$\tan\theta = -\frac{\sqrt{3}}{3}$ $\quad \cot\theta = -\sqrt{3}$

Find the five remaining function values of θ if $\sec\theta = -\frac{3}{2}$ and θ is in quadrant III. **SHOW YOUR WORK.** **SCORE: ___ / 10 POINTS**



$x = -2$

$r = 3$

$y = -\sqrt{3^2 - (-2)^2}$

$= -\sqrt{5}$

$\sin\theta = -\frac{\sqrt{5}}{3}$ $\quad \csc\theta = -\frac{3\sqrt{5}}{5}$

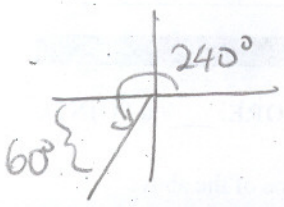
$\cos\theta = -\frac{2}{3}$

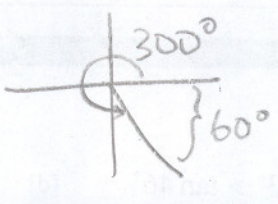
$\tan\theta = \frac{\sqrt{5}}{2}$ $\quad \cot\theta = \frac{2\sqrt{5}}{5}$

Find all values of θ in $[0^\circ, 360^\circ]$ such that $\sin\theta = -\frac{\sqrt{3}}{2}$. **SHOW YOUR WORK.** **SCORE: ___ / 10 POINTS**

REF ANGLE $= 60^\circ$

θ IN Q_3 OR Q_4





$\theta = 240^\circ$ OR 300°

SUBMIT THIS SECTION BEFORE YOU PICK UP YOUR CALCULATOR

Math 51 (7:30am – 8:20am) GREEN
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Thu Apr 23, 2009

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CALCULATORS ALLOWED ON THIS SECTION

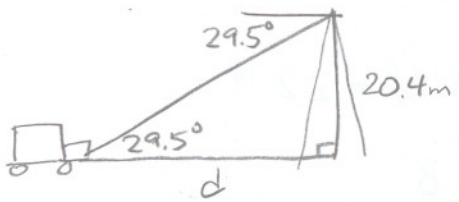
Convert 39.9730° to degrees, minutes and seconds. **SHOW YOUR WORK.** **SCORE: ___ / 5 POINTS**

$39^\circ + 0.9730 * 60' = 39^\circ 58.38'$
$= 39^\circ 58' + 0.38 * 60''$
$= 39^\circ 58' 22.8''$

Find $\sec 76^\circ 54' 32''$ to 4 decimal places. **SHOW WHAT YOU TYPED IN YOUR CALCULATOR.** **SCORE: ___ / 4 POINTS**

$$\frac{1}{\cos\left(76 + \frac{54}{60} + \frac{32}{3600}\right)} = 4.4150$$

The angle of depression from the top of a $20.4m$ tall television tower to a utility truck is 29.5°. How far is the truck from the tower ? **SHOW YOUR WORK.** **SCORE: ___ / 12 POINTS**

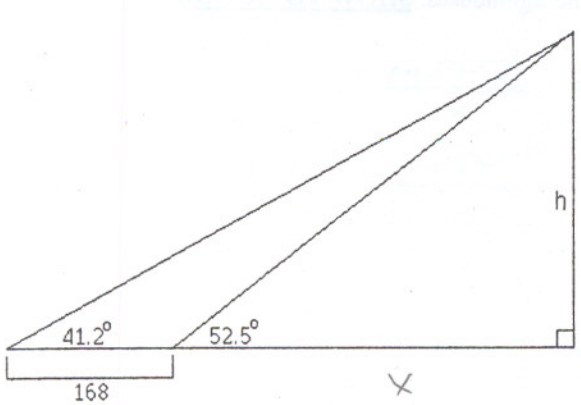


$\tan 29.5^\circ = \frac{20.4m}{d}$

$d = \frac{20.4m}{\tan 29.5^\circ} = 36.1m$

THE TRUCK IS 36.1m FROM THE TOWER

Find h in the diagram. **SHOW YOUR WORK.** **SCORE: ___ / 12 POINTS**



$\tan 52.5^\circ = \frac{h}{x} \Rightarrow x = \frac{h}{\tan 52.5^\circ}$

$\tan 41.2^\circ = \frac{h}{x+168} \Rightarrow x = \frac{h}{\tan 41.2^\circ} - 168$

$\frac{h}{\tan 52.5^\circ} = \frac{h}{\tan 41.2^\circ} - 168$

$\frac{h}{\tan 52.5^\circ} - \frac{h}{\tan 41.2^\circ} = -168$

$h\left(\frac{1}{\tan 52.5^\circ} - \frac{1}{\tan 41.2^\circ}\right) = -168$

$h = \frac{-168}{\frac{1}{\tan 52.5^\circ} - \frac{1}{\tan 41.2^\circ}} = 448$

Find the least positive measure of an angle coterminal with -2739°. **SHOW YOUR WORK.** **SCORE: ___ / 4 POINTS**

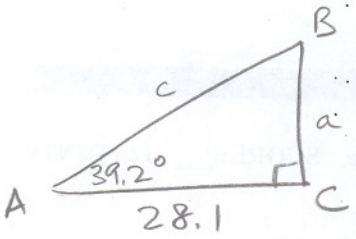
$-2739^\circ + 360^\circ * 8 = 141^\circ$

Find a value of θ in $[0^\circ, 90^\circ]$ such that $\cot\theta = 7.2$. Round your answer to 4 decimal places. **SHOW WHAT YOU TYPED IN YOUR CALCULATOR.** **SCORE: ___ / 5 POINTS**

$\tan\theta = \frac{1}{7.2}$

$\theta = \tan^{-1}\frac{1}{7.2} = 7.9072$

Solve the right angle triangle ABC if $C = 90.0^\circ$, $A = 39.2^\circ$ and $b = 28.1$. **SHOW YOUR WORK.** **SCORE: ___ / 12 POINTS**



$\cos 39.2^\circ = \frac{28.1}{c}$

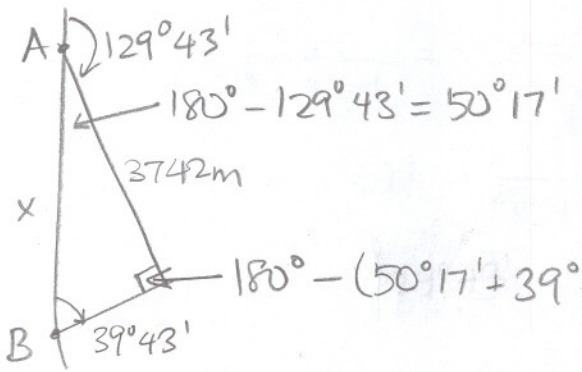
$c = \frac{28.1}{\cos 39.2^\circ} = 36.3$

$\tan 39.2^\circ = \frac{a}{28.1}$

$a = 28.1 \tan 39.2^\circ = 22.9$

$B = 90^\circ - 39.2^\circ = 50.8^\circ$

Two lighthouses are located on a north-south line. From lighthouse A, the bearing of a ship $3742m$ away is $129^\circ 43'$. From lighthouse B, the bearing of the ship is $39^\circ 43'$. Find the distance between the lighthouses. **SHOW YOUR WORK.** **SCORE: ___ / 12 POINTS**



$\sin 39^\circ 43' = \frac{3742m}{x}$

$x = \frac{3742m}{\sin 39^\circ 43'} = 5856m$

THE LIGHTHOUSES ARE 5856m APART