

## The “No Calculators” Pages

**Instructions:** See front page for general instructions. Finish this page before going to the rest. You may not return to this page once you turn on your calculator.

N1.) (12 points) Convert

12

(a) the angle  $\frac{3\pi}{8}$  radians to an exact degree measure, and

(b) the angle  $72^\circ$  to an exact radian measure.

(★) Convert  $\frac{3\pi}{7}$  radians to degrees-minutes-seconds, to the nearest second of arc.

N2.) (12 points) Find exact algebraic values for each of the following, where defined. Otherwise, write “undefined.”

24

(a)  $\sin 135^\circ$

(e)  $\tan(-90^\circ)$

(i)  $\tan \pi/3$

(b)  $\cos 120^\circ$

(f)  $\sin 4\pi/3$

(j)  $\cos 270^\circ$

(c)  $\sin(-90^\circ)$

(g)  $\csc 30^\circ$

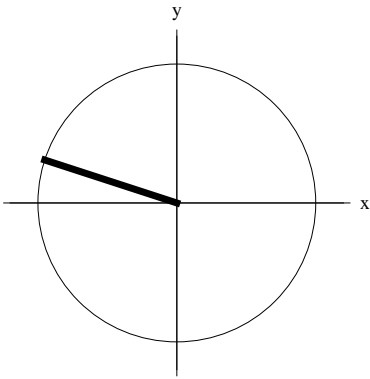
(k)  $\sin 5\pi/6$

(d)  $\cos(150^\circ)$

(h)  $\sec 315^\circ$

(l)  $\cos 3\pi/4$

- N3.) (8 points) An angle  $\theta$  is shown in standard position. Give approximate values for  $\sin \theta$  and  $\cos \theta$ . 32



$\sin \theta \approx$

$\cos \theta \approx$

- N4.) (10 points) For each below, circle the inequality ( $<$  or  $>$ ) that makes the statement true. 42  
*Incorrect answers will be awarded negative points to discourage random guessing.* (So perhaps you should leave an answer blank if you have no idea.)

(a)  $\cos 66^\circ < > \cos 67^\circ$

(f)  $\sin 87^\circ < > \sin 97^\circ$

(b)  $\cos 155^\circ < > \cos 156^\circ$

(g)  $\sin 200^\circ < > \tan 255^\circ$

(c)  $\cos 244^\circ < > \cos 245^\circ$

(h)  $\sin 75^\circ < > \sin^2 75^\circ$

(d)  $\cos 353^\circ < > \cos 363^\circ$

(i)  $\tan 170^\circ < > \tan^2 170^\circ$

(e)  $\sin 77^\circ < > \sin 88^\circ$

(j)  $\sin 2^\circ < > \cos 2^\circ$

- N5.) (12 points) Write the *exact algebraic values* of the functions  $\sin \theta$ ,  $\cos \theta$  and  $\tan \theta$  for the angle  $\theta$  in standard position having the point  $(-2\sqrt{5}, 3)$  on its terminal side. 54

$\sin \theta =$

$\cos \theta =$

$\tan \theta =$

Test #1

**Instructions:** Answer all problems correctly. Calculators are allowed (except on the “No Calculators Page”) but *they must not be used to retrieve information or formulas*. Feel free to leave numerical answers in “calculator-ready form.” Each starred problem is extra credit, and each  $\star$  is worth 5 points.

The phrase *exact algebraic values* appears throughout the test. Quantities such as  $\sqrt{3}$ ,  $5/3$ , etc., are exact algebraic values, as opposed to *numerical approximations*, such as 1.732, 1.666, etc., which are not.

A maximum of 115 points (out of 100) will be awarded on this test. Enjoy.

1. (8 points) The terminal side of an angle  $\theta$  in standard position lies on the line  $3y - x = 0$ , with  $x < 0$ . Find exact algebraic values for  $\sin \theta$  and  $\tan \theta$ .

62

$\sin \theta =$
$\tan \theta =$

2. (9 points) Write

71

(a) a reciprocal identity involving  $\tan \theta$ ,

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(b) a Pythagorean identity involving  $\tan \theta$ ,

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(c) a cofunction identity involving  $\tan \theta$ .

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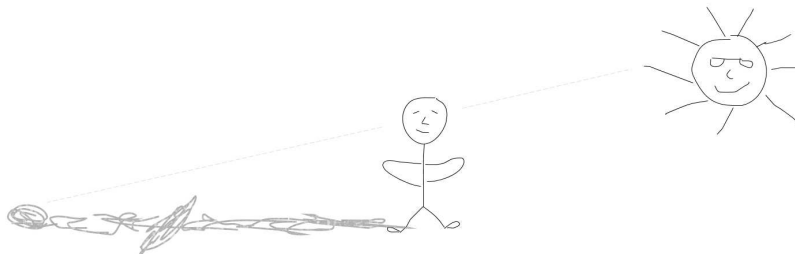
3. (12 points) Assuming  $\cos \theta = 1/4$ , and  $\theta \in \text{QIV}$ , give exact algebraic values for the following. 83

(a)  $\sin \theta$

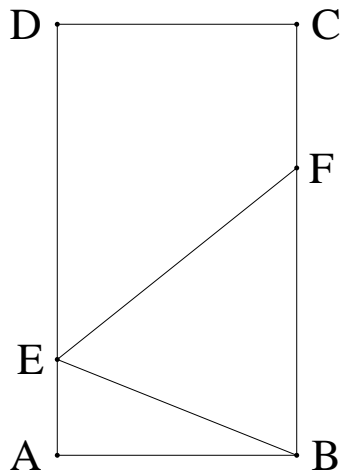
(b)  $\tan \theta$

(c)  $\sec \theta$

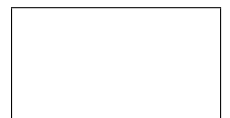
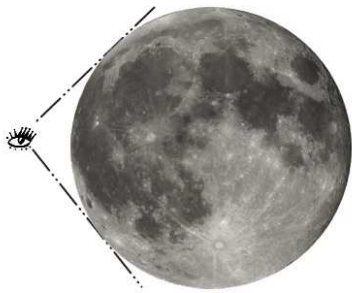
4. (8 points) A child standing upright in the morning sun casts an 8.10-foot shadow on the level ground when the sun has an angle of elevation of just  $21.3^\circ$ . How tall is the child? 91



5. (8 points) In the figure below,  $ABCD$  is a rectangle,  $AE = 2$ ,  $ED = 7$ ,  $FC = 3$ , and  $\angle BFE = 49^\circ$ . Find the length  $BE$ . 99



6. (8 points) At a point 118 miles from the *surface* of one of their five moons, space creatures measure the *angular field of view* of the moon to be about  $96.4^\circ$ . (The angular field of view is the measure of *the angle formed at the eye* by two tangent lines drawn from the eye to opposite points on the visible disk of the moon.) Based on these measurements, what is the radius of their moon (which looks quite like our own)? 107



7. (12 points) A ship leaves port and travels for 5.3 miles with a bearing of  $S53^\circ E$ . The ship then travels 8.1 miles with a bearing of  $S81^\circ W$ . How far is the ship from port?

119

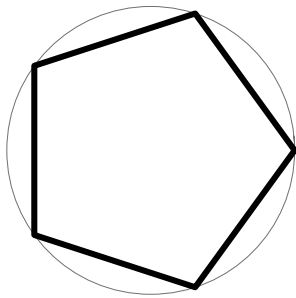
8. (8 points) A tourist views a tower whose height is 327.0 feet. At some distance from its base the tourist measures the angle of elevation to the top of the tower to be  $13^{\circ}20'$ . The tourist then moves some distance  $D$  directly toward the tower and now finds that the angle of elevation is  $18^{\circ}40'$ . Compute the distance  $D$ .



\*\*\* Extra Credit \*\*\*

(You may do these on the back of the previous page if you wish.)

- A.) The length of the perimeter (the sum of the sides) of a regular pentagon inscribed in a circle is 20.00 units. Find the radius of the circle.



- B.) (★) A parallelogram has sides measuring 44.4 inches and 33.3 inches, and has an acute angle of  $22.2^\circ$ . Find the length of the long diagonal of the parallelogram.
- C.) (★) Write an equation for the line passing through the point  $(-2, 3)$  and making a *counterclockwise* angle of  $34^\circ$  with respect to the positive  $x$ -axis (with the positive  $x$ -axis as the initial side of the angle).
- D.) (★··★) Ask a question you wish I had asked and answer it. Points will vary.