

Name _____

Circle the correct answer to 1 – 3. You must show your work to receive credit.

(8 pts) 1. Completely simplify the expression $\frac{\sin x}{1 + \sin x} - \frac{\sin x}{1 - \sin x}$

A. $2 \csc^2 x$

B. $-2 \tan^2 x$

C. $2 \sec^2 x$

D. $-2 \cot^2 x$

E. $-2 \csc^2 x$

(8 pts) 2. Find the exact value of $\cos^{-1} \cos \frac{4}{3}$.

A. $\frac{5}{3}$

B. $\frac{4}{3}$

C. $\frac{2}{3}$

D. $\frac{1}{3}$

E. None of these

(8 pts) 3. Find the value of $\cos \frac{\theta}{2}$ if $\tan \theta = \frac{15}{8}$ and $180^\circ < \theta < 270^\circ$.

A. $\frac{3}{5}$

B. $-\frac{3}{\sqrt{34}}$

C. $\frac{3}{\sqrt{34}}$

D. $-\frac{5}{\sqrt{34}}$

E. None of these

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Place your answer in the space provided. You must show your work to receive credit.

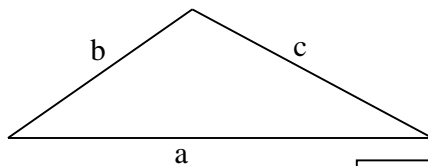
- (12 pts) 4. Find the exact solutions to $\cos 2x = 2 + 3 \sin x$ in $[0^\circ, 360^\circ)$.
 (Do not use a calculator.)

x =

- (12 pts) 5. If θ is in Q III and ϕ is in Q II such that $\tan \theta = 24/25$ and $\sin \phi = 15/17$, find the exact value of $\tan(\theta - \phi)$. (Do not use a calculator.)

$\tan(\theta - \phi) =$

- (12 pts) 6. In the triangle below, find a and c, rounded to the nearest tenth of a unit, if $A = 20^\circ$, $B = 31^\circ$ and $b = 210$.



a =
 c =

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Place your answer in the space provided. You must show your work to receive credit.

- (12 pts) 7. Verify the following identity (you must work with only one side at a time):
 $\sec^2 t \csc^2 t = \sec^2 t + \csc^2 t$

- (14 pts) 8. A water tower is located on level ground 325 feet from a building. From a window in the building it is observed that the angle of elevation to the top of the tower is 39° and the angle of depression to the bottom of the tower is 25° . (Draw and label a sketch, set up an equation(s) and solve.)

- a) How tall is the tower, to the nearest foot?

Tower height =

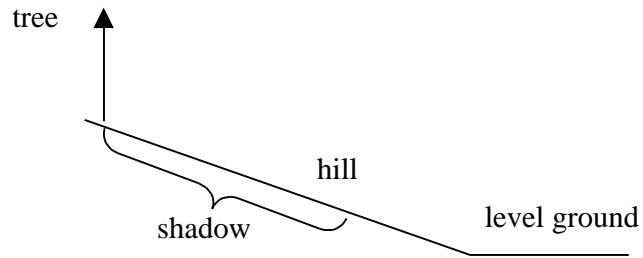

- b) How high is the window, to the nearest foot?

Window height =

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Place your answer in the space provided. You must show your work to receive credit.

- (14 pts) 9. A tree on a hillside casts a shadow 215 feet down the hill. If the angle of elevation of the hillside is 22° and the angle of elevation of the sun is 52° , find the height of the tree to the nearest foot. (Set up an equation(s) and solve.)

sun 

Height =