MATH 115 **NAME:**
TRIGONOMETRY **ID#:**

TAKE-HOME EXAM 1

Solve the following problems showing all your work for full credit.

1. Given angle $A = 4x + 20$ and angle $B = 6x + 10$. Find their degree measures if A and B are:

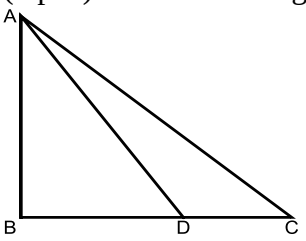
a) (4 pts.) complementary angles;

b) (4 pts.) supplementary angles.

2. (2 pts.) The **London Eye** (similar to a bicycle wheel) makes one rotation in approximately 30 minutes. What is the measure of the angle (in degrees) that a cart (spoke) will rotate in 14 minutes?

3. (4 pts.) A house has a roof with 45° pitch (the angle the roof makes with the house). If the house is 80 feet wide, what are the lengths of the sides of the roof that form the attic? Round to the nearest foot.

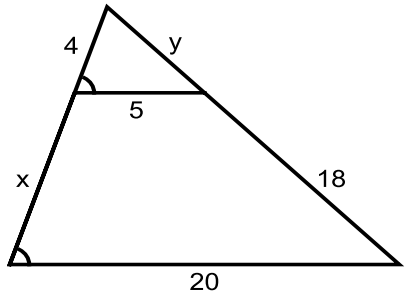
4. (5 pts.) In the following picture, if $AB = 4$, $AD = 5$, and $AC = \sqrt{41}$, find DC.



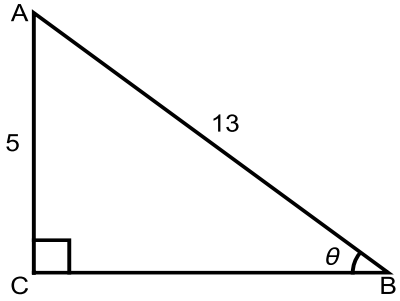
5. (3 pts.) Given that the two triangles ABC and MNP are similar and $AC = 12$, $AB = 9$, and $MN = 3$, find MP.

6. (3 pts.) The shadow of a flagpole measures 15 feet. At the same time of day, the shadow of a stake 2 feet above ground measures 0.75 foot. How tall is the flagpole? (Assume both stake and tree are perpendicular to the ground.)

7. (4 pts.) In the following picture, find x and y.



8. (6 pts.) For the given right triangle, find all trigonometric function values of angle θ.



9. Perform the indicated operations using the angles $A = 5^\circ 17' 35''$ and $B = 63^\circ 28' 29''$.

a) (2 pts.) $A + B =$

b) (2 pts.) $90^\circ - B =$

c) (2 pts.) $B - A =$

10. (2 pts.) Convert the angle $63^\circ 10' 9''$ from degrees-minutes-seconds to decimal degrees. Round to the nearest thousandth.

11. (3 pts.) Convert the angle 25.375° from decimal degrees to degrees-minutes-seconds.

12. (4 pts.) Find the exact value of $\dfrac{\sin 45^\circ \cdot \cot 30^\circ}{\csc^2 60^\circ}$.

13. Solve a right triangle (round the answer to two decimal places) if:

a) (5 pts.) $a = 5$ in, $b = 12$ in;

b) (5 pts.) $\alpha = 55^\circ$, $c = 20$ ft.

14. (4 pts.) An electric line is strung from 20-foot pole to a point 12 feet up on the side of a house. If the pole 250 feet from the house, what angle does the electric line make with the pole?

15. (2pts.) Find the angle B with the smallest positive measure that is coterminal with the angle $A = -30^\circ$. Assume that both angles are in standard position.

16. (8 pts.) The terminal side of an angle θ in standard position passes through the point $(-4,5)$. Calculate the values of the six trigonometric functions of angle θ.

17. (6 pts.) Let angle θ be the angle of elevation from a point on the ground to the top of a tree. If $\sin\theta = \frac{40}{41}$ and the tree is 20 feet high, then how far from the base of the tree is the point on the ground?

18. (2 pts.) Evaluate the expression $\sin(-270^\circ) + \cos(450^\circ)$.

19. (6 pts.) If $\cos\theta = \frac{5}{13}$ and the terminal side of θ lies in quadrant IV, find all the other trigonometric function values of θ.

20. (5 pts.) Find $\sin\theta$ and $\cos\theta$ if $\tan\theta = -\frac{3}{4}$ and the terminal side of θ lies in quadrant II.

21. Simplify each expression. Leave all answers in terms of $\sin\theta$ and $\cos\theta$.

a) (2 pts.) $\frac{\cos\theta}{\cot\theta} =$

b) (5 pts.) $\frac{(\sin\theta - \cos\theta)^2 - 1}{\sin\theta\cos\theta} =$