Directions: Show all work to receive partial credit. When asked to give exact answers, points will be deducted for providing decimal answers. Each question is worth 5 points. Good luck!

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Convert the angle to D° M' S'' form. Round the answer to the nearest second.
1) 183.82°

Convert the angle in degrees to radians. Express the answer as multiple of π.
2) 54°

Convert the angle in radians to degrees.
3) \( \frac{23}{9} \pi \)

Find the exact value of the indicated trigonometric function of θ.
4) \( \cos \theta = \frac{7}{25}, \quad \frac{3\pi}{2} < \theta < 2\pi \) Find cot θ.
Use transformations to graph the function.

5) \( y = -2 \cos\left( \frac{1}{3}x \right) \)

Graph the function. Show at least one period.

6) \( y = -2 \sin\left( 5x + \frac{\pi}{2} \right) \)

Graph the function.

7) \( y = 3 \sec(2x) \)
Find the exact value of the expression.

8) \( \csc \left( \cos^{-1} \frac{\sqrt{3}}{2} \right) \)

Establish the identity.

9) \( \tan u (\csc u - \sin u) = \cos u \)

Find the exact value of the expression.

10) \( \cos \frac{5\pi}{18} \sin \frac{\pi}{9} - \cos \frac{\pi}{9} \sin \frac{5\pi}{18} \)

Establish the identity.

11) \( \sin(x + y) - \sin(x - y) = 2 \cos x \sin y \)
Use the information given about the angle $\theta$, $0 \leq \theta \leq 2\pi$, to find the exact value of the indicated trigonometric function.

12) \(\csc \theta = -\frac{4}{3}, \tan \theta > 0\) \quad \text{Find} \cos(2\theta).

13) \(\tan \theta = \frac{12}{5}, \pi < \theta < \frac{3\pi}{2}\) \quad \text{Find} \sin \left(\frac{\theta}{2}\right).

Establish the identity.

14) \(\sin(5\theta) \sin(8\theta) \cos(5\theta) \cos(8\theta) = \frac{\cos^2(3\theta) - \cos^2(13\theta)}{4}\)

Express the sum or difference as a product of sines and/or cosines.

15) \(\cos \frac{7\theta}{2} + \cos \frac{5\theta}{2}\)
Solve the equation on the interval $0 \leq \theta < 2\pi$.

16) $1 - \sin \theta = \frac{1}{2}$

17) $\sqrt{2} \cos(2\theta) = 1$

Solve the equation. Give a general formula for all the solutions.

18) $\cos(2\theta) = \frac{\sqrt{2}}{2}$

Solve the equation on the interval $0 \leq \theta < 2\pi$.

19) $2\cos^2 \theta - 3\cos \theta + 1 = 0$
20) \[ \cos(2\theta) + 6 \sin^2 \theta = 2 \]

EXTRA CREDIT:

21) The altitude of a projectile in feet (neglecting air resistance) is given by

\[ y = (\tan \theta)x - \frac{16}{v^2 \cos^2 \theta} x^2, \]

where \( x \) is the horizontal distance covered in feet and \( v \) is the initial velocity of the projectile at an angle \( \theta \) from the horizontal. Find the firing angle (in degrees) of a projectile fired at an initial velocity of 100 feet per second so that it strikes the ground 312.5 feet from the firing point.