MTH 112 Final Review

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1. Find the angle coterminal with $\frac{29\pi}{6}$ such that $0 \leq \theta < 2\pi$. Sketch θ in standard position.
2. Let $f(x) = \dfrac{\cos x \sin x \tan x}{x - x^3}$. Determine if the function is even, odd, or neither.
3. Find the exact value of $\sin \frac{-4\pi}{3}, \cos \frac{-4\pi}{3}, \tan \frac{-4\pi}{3}, \csc \frac{-4\pi}{3}, \sec \frac{-4\pi}{3}, \cot \frac{-4\pi}{3}$.
4. Evaluate $\arcsin \frac{-\sqrt{3}}{2}$.
5. Evaluate $\arctan \sqrt{3}$.
6. Find the exact values of the other five trigonometric functions at θ if $\cos\theta = \frac{-4}{7}$ and $\tan\theta < 0$. Draw a right triangle and label the angle θ to help.
7. Let $f(x) = 5\sin\left(3x + \frac{\pi}{2}\right) - 2$. Determine the amplitude and period of f, then sketch $y = f(x)$.
8. A triangle has sides of lengths a, b, c and angles α, β, γ, where α is opposite a, β is opposite b, and γ is opposite c.

   If $\gamma = 90°$, $a = 3$, and $b = 4$, then find the missing sides and angles. When necessary, round values to the nearest hundredth.
9. A triangle has sides of lengths a, b, c and angles α, β, γ, where α is opposite a, β is opposite b, and γ is opposite c.

   If $\gamma = \frac{\pi}{2}$, $\alpha = \frac{2\pi}{7}$, and $b = 4$, then find the missing sides and angles. When necessary, round values to the nearest hundredth.
10. A triangle has sides of lengths a, b, c and angles α, β, γ, where α is opposite a, β is opposite b, and γ is opposite c.

    If $a = 6$, $b = 9$, and $c = 10$, then solve the triangle. If multiple triangles are plausible, then solve each one. Round each angle to the nearest degree.
11. A triangle has sides of lengths a, b, c and angles α, β, γ, where α is opposite a, β is opposite b, and γ is opposite c.

    If $\beta = 33°$, $b = 3$, and $c = 4$, then solve the triangle. If multiple triangles are plausible, then solve each one. When necessary, round values to the nearest hundredth.
12. A triangle has sides of lengths a, b, c and angles α, β, γ, where α is opposite a, β is opposite b, and γ is opposite c.

    If $a = 31$, $b = 26$, and $\beta = 48°$, then solve the triangle. If multiple triangles are plausible, then solve each one. When necessary, round values to the nearest hundredth.
13. A triangle has sides of lengths a, b, c and angles α, β, γ, where α is opposite a, β is opposite b, and γ is opposite c.

    If $a = 30$, $c = 13$, and $\gamma = \frac{2\pi}{5}$, then solve the triangle. If multiple triangles are plausible, then solve each one. When necessary, round values to the nearest hundredth.

14. Simplify $\sin(-x)\cos(-x)\tan(-x)$.

15. Simplify $3\sin^3\theta\csc\theta + \cos^2\theta + 2\cos(-\theta)\cos\theta$.

16. Find all solutions to $2\sin(x) - 3\sin(-x) = 10$.

17. Find all solutions to $2\sin^2 x - 3\sin^2(-x) = 10$.

18. Find all solutions to $2\cos(4\theta) = -\sqrt{3}$.

19. Find the exact value of $\cos\left(\frac{11\pi}{12}\right)$.

20. Find the exact value of $\sin\left(\frac{7\pi}{8}\right)$.

21. If $\sin x = \frac{2}{9}$ and $\cos x > 0$, then find the exact values of $\cos(2x)$, $\sin(2x)$, and $\tan(2x)$.

22. Rewrite $3\cos(4x)\sin(5x)$ as a sum or a difference.

23. Draw a Cartesian plane, label the x- and y-axes, draw tick marks, and provide a scale. On your plane, plot the polar point $\left(3, \frac{-3\pi}{4}\right)$, and convert it to Cartesian coordinates.

24. Draw a Cartesian plane, label the x- and y-axes, draw tick marks, and provide a scale. On your plane, plot the polar point $\left(5, \frac{7\pi}{6}\right)$, and convert it to Cartesian coordinates.

25. Convert the Cartesian equation $y = 4x^2$ to polar.

26. Let $z = 3i$. Convert z to polar form (that is, $re^{i\theta}$). Plot z on a complex plane, labeling the axes appropriately.

27. Let $z = -3 - 3i$. Convert z to polar form (that is, $re^{i\theta}$). Plot z on a complex plane, labeling the axes appropriately.

28. Let $z = \sqrt{2}(\cos 205° + i\sin 205°)$ and $\omega = 2\sqrt{2}(\cos 118° + i\sin 118°)$. Find $z\omega$, $\frac{z}{\omega}$, and z^3. Express each result in polar form.

29. Consider the points $P(-1,3)$, $Q(1,5)$, and $R(-3,7)$. Let $\mathbf{u} = \overrightarrow{PQ}$ and $\mathbf{v} = \overrightarrow{PR}$.

    a. Find the component form of $\mathbf{u}$.
    b. Find the component form of $\mathbf{v}$.
    c. Express $\mathbf{u}$ in terms of $\mathbf{i}$ and $\mathbf{j}$.
    d. Plot $\mathbf{u}$ and $\mathbf{v}$ on a Cartesian plane.
    e. Plot $\mathbf{u} + \mathbf{v}$ on the same plane.
    f. Find $\mathbf{u} + \mathbf{v}$.
    g. Find $2\mathbf{u} - 3\mathbf{v}$.
    h. Find $\mathbf{u} \cdot \mathbf{v}$.