
1. (8 points) Convert radian to degree, or degree to radian

(a) $-\frac{\pi}{12}$

(b) 225°

2. (5 points each) Using reference angles, give the exact value of the following:

a) $\cos(240^\circ) =$

b) $\tan(390^\circ) =$

c) $\csc\left(-\frac{2\pi}{3}\right) =$

3. (6 points) If $\sec \theta = 4$ and $\sin \theta < 0$ find:

a) The quadrant in which θ is

b) $\cos \theta =$

c) $\sin \theta =$

4. (4 points) When the top of a tree is viewed from a distance of 150 feet from the base, the angle of elevation is $\frac{\pi}{6}$. Find the height of the tree.

5. (12 points) Refer to the graph below.

a) Find the amplitude: _____

b) Find the period: _____

c) Circle the correct equation for the graph.

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

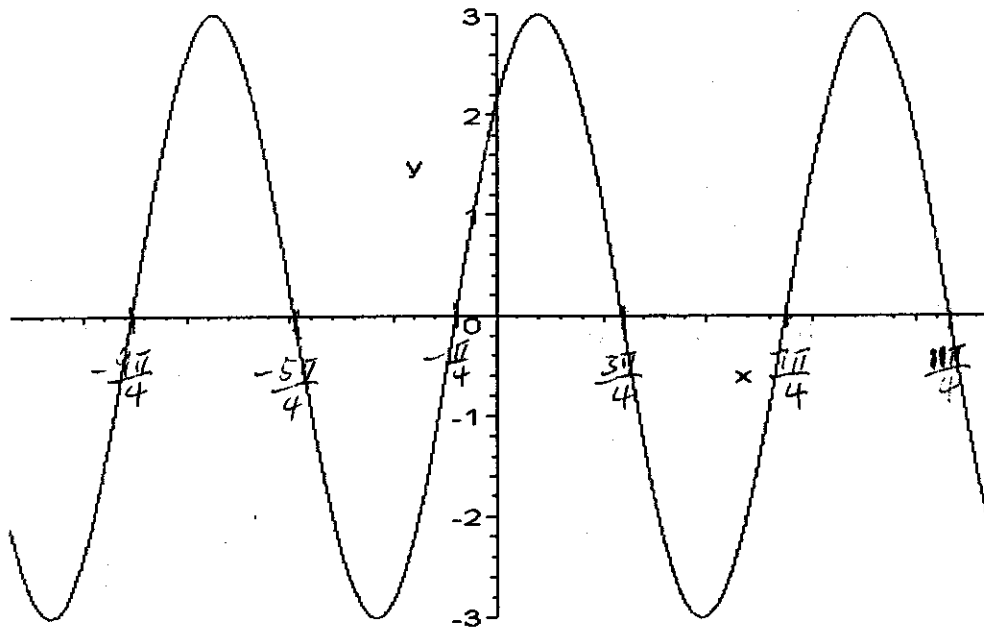
$$y = 3\cos\left(x + \frac{\pi}{4}\right)$$

$$y = 3\cos\left(\frac{1}{4}x + \frac{\pi}{4}\right)$$

$$y = -2\sin\left(\frac{1}{2}x\right)$$

$$y = 3\sin\left(x + \frac{\pi}{4}\right)$$

$$y = 3\sin\left(\frac{1}{4}x + \frac{\pi}{4}\right)$$



6. (10 points) Verify the identity by transforming the left side of the equation into the right.

$$(\tan \theta + \cot \theta) \tan \theta = \sec^2 \theta$$

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7. (5 points each)

- a) Find the length of the arc cut off by a sector with central angle 150° on a circle of diameter 16 cm.

- b) Find the area of the sector in part (a).

8. (10 points) Verify by transforming the left side into the right side:

$$\cot(-\theta)\cos(-\theta) + \sin(-\theta) = -\csc\theta$$

9. (5 points each) Use a formula for negatives to find the exact value of each of the following:

a) $\cot\left(-\frac{4\pi}{3}\right) =$

b) $\sin\left(-\frac{3\pi}{2}\right) =$

c) $\sec\left(\frac{-7\pi}{4}\right) =$

10. (10 points) From a point on level ground the angle of elevation of the ground to the top of a tower is 45° . From a point 15 feet closer, the angle of elevation is 60° . Find the height of the tower.

1. Evaluate: (6 points each)

a) $\cos\left[2\arcsin\left(-\frac{4}{5}\right)\right] =$

b) $\cot\left(\arcsin\left(\frac{12}{13}\right)\right) =$

c) $\cos^{-1}\left(\cos\left(\frac{11\pi}{6}\right)\right) =$

d) $\sin\left(\sin^{-1}\left(\frac{\pi}{2}\right)\right) =$

2. For $f(x) = \frac{2}{7x-1}$

- a) Show that $f(x)$ is one to one. (5 points)
(Use the definition.)

- b) Find $f^{-1}(x)$. (5 points)

3. Express the following as a single sine or cosine and give the value of the expression:

(6 points)

$$\sin \frac{5\pi}{6} \cos \frac{\pi}{6} - \cos \frac{5\pi}{6} \sin \frac{\pi}{6} =$$

4. If θ is in Quadrant III and $\cot \theta = \frac{4}{3}$, find: (6 points)

$$\sin\left(\frac{\pi}{2} - \theta\right)$$

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5. Find all the solutions of $2 \sin 2\theta - \sqrt{2} = 0$. (10 points)

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6. Verify the following: (7 points each)

a) $\frac{\sin^2(2\theta)}{\sin^2 \theta} = 4 - 4 \sin^2 \theta$

$$\text{b) } \cos\left(x - \frac{5\pi}{2}\right) = \sin x$$

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7. Find the exact value of $\cos 15^\circ$. (10 points)
(Use $15^\circ = 45^\circ - 30^\circ$)

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8. Find the solutions of $2\cos^2 x + 3\cos x = -1$ in the interval $[0, 2\pi)$. (10 points)

9. Find $\cos\left(\sin^{-1}\left(\frac{3}{5}\right) - \tan^{-1}\left(-\frac{4}{3}\right)\right)$

(10 points)

1. (10 points)

a) Convert the point $(-2\sqrt{2}, 2\sqrt{2})$ from rectangular coordinates to polar coordinates with $r > 0$ and $0 \leq \theta < 2\pi$

b) Convert the point $(5, \frac{7\pi}{6})$ from polar to rectangular coordinates.

2. (5 points) Express in the form $a + bi$: $-5cis \frac{5\pi}{2}$.

3. (10 points) Find the value of the following:

a) $|5 - 8i|$

b) $|\sqrt{3}i|$

4. (10 points) Use DeMoivre's Theorem to change $\left(-\frac{\sqrt{3}}{2} - \frac{1}{2}i\right)^5$ to a + bi form.

5. (5 points) Express $3 + 3\sqrt{3}i$ in trigonometric form with $0 \leq \theta < 2\pi$.

6. (12 points) Given $z_1 = 4i$ and $z_2 = 3 + 3i$.

a) Find $z_1 z_2$ and put your answer in a + bi form.

b) Find $\frac{z_1}{z_2}$ and put your answer in a + bi form.

7. (8 points) Find the two square roots of $-64i$. Put your answer in a + bi form.

$$w_k = \sqrt[n]{r} \left[\cos\left(\frac{\theta + 2\pi k}{n}\right) + i \sin\left(\frac{\theta + 2\pi k}{n}\right) \right] \text{ where } k = 0, 1, 2, \dots, n-1$$

8. (10 points) Find the four fourth roots of $-5\sqrt{2} + 5\sqrt{2}i$. **Leave your answers in trigonometric form.**

9. (10 points) Prove by induction $1+4+7+\dots+(3n-2) = \frac{n(3n-1)}{2}$ is true for all the Natural Numbers. (Show **ALL YOUR WORK**, each step must be shown.)

10. (10 points) In triangle ABC, $\gamma = 30^\circ$, $b = 4\sqrt{3}$, $a = 4$. Find the possible values of β, α, c .