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

(a) $-\frac{\pi}{12}$ (b) 225^0

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

a) $\cos(240^0)=$

b) $\tan\left(390^0\right)=$

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.

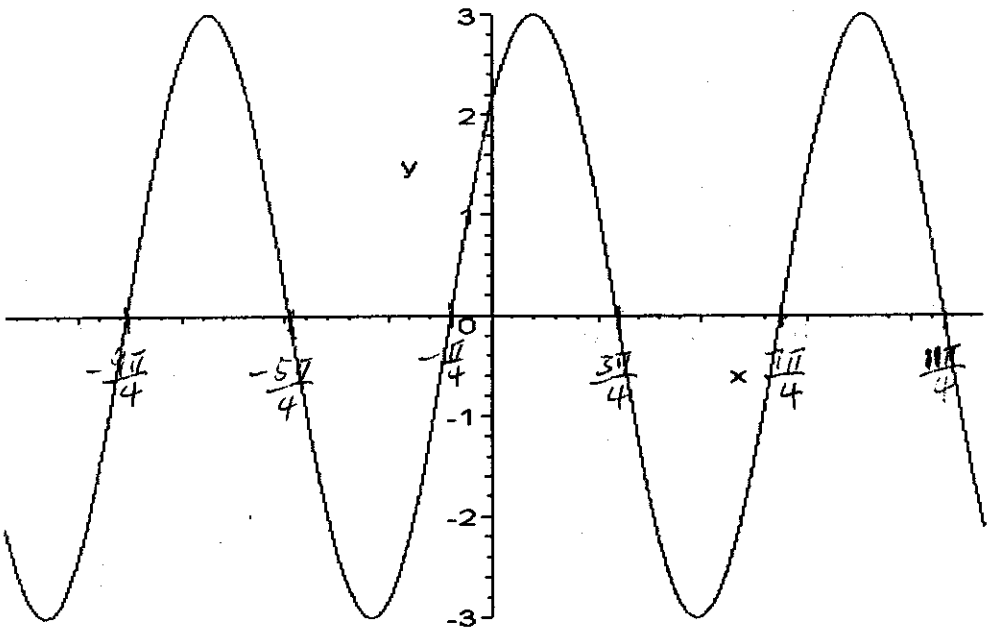
a) Find the amplitude:_____

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.

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

7. (5 points each)

a) Find the length of the arc cut off by a sector with central angle 150^0 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 45^0. From a point 15 feet closer, the angle of elevation is 60^0. 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 $f(x) = \dfrac{2}{7x-1}$

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

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

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

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

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

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 $\left(-2\sqrt{2}, 2\sqrt{2}\right)$ from rectangular coordinates to polar coordinates with r > 0 and $0 \le \theta < 2\pi$

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

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

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

a) $|5-8i|$

b) $\left|-\sqrt{3}i\right|$

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 $0 \le \theta < 2\pi$.

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.

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

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

10. (10 points) In triangle ABC, $\gamma = 30^0, b = 4\sqrt{3}, a = 4$. Find the possible values of β, α, c.