Solutions

Trigonometry II Practice Exam - ANSWERS

ANSWERS

1. C	**NR 2)** 28	**19.** B	**28.** D
2. D	**NR 3)** 1	**20.** D	**NR 7.** 4
NR 1) 1.50	**11.** C	**21.** D	**29.** B
3. A	**12.** C	**NR 5.** 2413	**30.** C
4. A	**13.** A	**22.** A	**31.** C
5. D	**14.** C	**23.** C	**32.** A
6. A	**NR 4)** 0.7	**24.** B	**33.** B
7. D	**15.** A	**25.** B	
8. A	**16.** C	**NR 6.** 0.5	
9. C	**17.** B	**26.** A	
10. B	**18.** A	**27.** D	

1. Analyze each of the possible answers to see which one gives back sin 75°

Look at sin 45° cos 30° + cos 45° sin 30°
Comparing this expression with the identity $\sin(A+B)=\sin A\cos B+\cos A\sin B$,
it can be seen that the value of A is 45°, and B is 30°

Therefore, $\sin(A+B)=\sin(45^0+30^0)=\sin 75^0$
The answer is **C**.

2. The graph of tan5x can be obtained by horizontally stretching the original graph by a factor of $\frac{1}{5}$. This will make the arms of the graph much closer to each other.

Multiply the original general solution by $\frac{1}{5}$ to obtain the new general solution.

$$\frac{1}{5}\left(-\frac{\pi}{4}+n\pi\right)=-\frac{\pi}{20}+\frac{n\pi}{5}$$

The answer is **D**.

NR #1 Substitute 2.1 radians into the right side $\frac{\cos^2 x+\sin x}{\sin^2 x}$. *(You will get the same answer if you use the left side, but since the right side is already in terms of sinx and cosx, it's easier to use.)*

$$\frac{\cos^2 2.1+\sin 2.1}{\sin^2 2.1}=1.50$$

*Make sure you have your calculator in radian mode.
**Type in $\cos^2 2.1$ as $(\cos(2.1))^2$

The answer is **1.50**

3. Substitute the height of 14 m for *h(t),* then graph both sides and find the point of intersection. The x-value will give the time 14 m is first reached.

$$14=-6\cos\frac{\pi}{20}t+9$$

$t=16.3$ s

The answer is **A**.

4. Use the identity $\cot^2 x = \csc^2 x - 1$

$$\cot^2 x + \csc x - 4$$
$$\left(\csc^2 x - 1\right) + \csc x - 4$$
$$\csc^2 x + \csc x - 5$$

The answer is **A**.

5. The equation $\cos^2 x + \cos x + 1 = 3$ can be transformed into the equation $\cos^2\left(\frac{x}{3}\right) + \cos\left(\frac{x}{3}\right) + 1 = 3$ using a horizontal stretch by a factor of 3.
(Remember that the reciprocal is what goes inside the brackets.)

The new general solution is found by multiplying the original general solution by 3.
$3(2n\pi) = 6n\pi$

What this means is that the new solutions will be $6\pi,\ 12\pi,\ 18\pi...$

The answer is **D**.

6. Start with the relationship $\tan A = \frac{\sin A}{\cos A}$

$$\tan A = \frac{\sin A}{\cos A}$$
$$\tan A \cos A = \sin A$$
$$\cos A = \frac{\sin A}{\tan A}$$

Now plug in the corresponding expressions $\sin A = \frac{m}{n}$ and $\tan A = \frac{m^2}{n^3}$

$$\cos A = \frac{\sin A}{\tan A}$$
$$\cos A = \frac{\frac{m}{n}}{\frac{m^2}{n^3}}$$
$$\cos A = \frac{m}{n} \times \frac{n^3}{m^2}$$
$$\cos A = \frac{n^2}{m}$$

The answer is **A**.

7. Use the identities $1+\tan^2 x = \sec^2 x$ and $\cos^2 x = 1-\sin^2 x$

$$\sqrt{\frac{1+\tan^2 x}{1-\sin^2 x}}$$

$$\sqrt{\frac{\sec^2 x}{\cos^2 x}}$$

$$\sqrt{\frac{\frac{1}{\cos^2 x}}{\cos^2 x}}$$

$$\sqrt{\frac{1}{\cos^2 x}\bullet\frac{1}{\cos^2 x}}$$

$$\sqrt{\frac{1}{\cos^4 x}}$$

$$\frac{1}{\cos^2 x}$$

$$\sec^2 x$$

The answer is **D**.

8. Use the identity $1+\tan^2 x = \sec^2 x$ → substitute $\frac{5}{7}$ for $\tan^2 x$

$$1+\frac{5}{7} = \sec^2 x$$

$$\frac{7}{7}+\frac{5}{7} = \sec^2 x$$

$$\sec^2 x = \frac{12}{7}$$

The answer is **A**.

9. Use the identity $\cos(2A) = \cos^2 A - \sin^2 A$

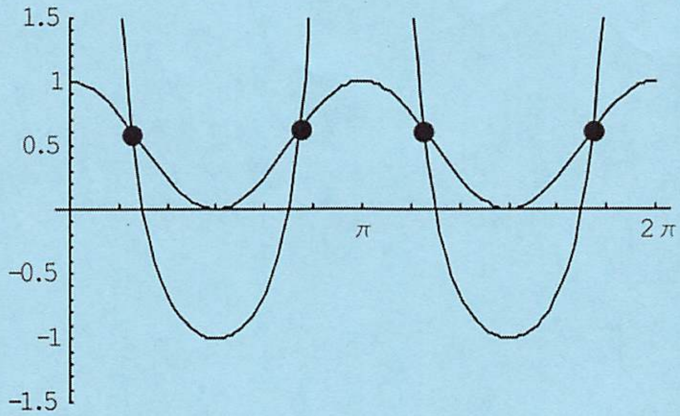
From the given expression $\cos^2(4\pi) - \sin^2(4\pi)$, we can see the A - value is 4π

Now replace 4π for A on the *left* side: $\cos(2A) = \cos[2(4\pi)] = \cos(8\pi)$

The answer is **C**.

10. When the domain is changed to $0 < x < 2\pi$, the solutions on the extreme ends are no longer included, so there are fewer solutions.
The answer is **B**.

NR #2 Graph the equation in your calculator. The interval $0 \le x \le 14\pi$ is too crowded to see clearly, so use the interval $0 < x < 2\pi$ instead.



If there are 4 solutions in the interval $0 \le x \le 2\pi$, there are 28 in the interval $0 \le x \le 14\pi$ since that interval is 7 times bigger. (We can do this since there are no points of intersection occurring at the extreme ends.)

The answer is **28**

NR #3 The expression $(\sin x + \cos x)^2$ must be foiled to get
$(\sin x + \cos x)(\sin x + \cos x) = \sin^2 x + 2\sin x \cos x + \cos^2 x$.

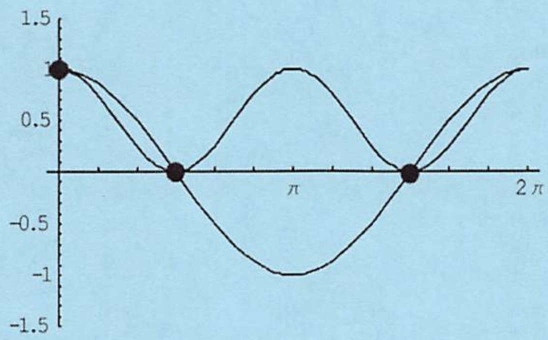
The error occurs in Step I. All other steps would be correct if the error did not occur.
The answer is **1**

11.

$$\frac{m\sin x\cot x}{4\csc x\tan x}=8$$
$$m\sin x\cot x=32\csc x\tan x$$
$$m\sin x\frac{\cos x}{\sin x}=32\frac{1}{\sin x}\frac{\sin x}{\cos x}$$
$$m\cos x=\frac{32}{\cos x}$$
$$m=\frac{32}{\cos^2 x}$$
$$m=32\sec^2 x$$

The answer is **C**.

12. Solve on your graphing calculator



Don't include the solution at 2π since it's not included in the domain.
The answer is **C**.

13. $\dfrac{\cos x}{1-2\sin x}$ is undefined when the denominator becomes zero

$$1-2\sin x=0$$
$$2\sin x=1$$
$$\sin x=\frac{1}{2}$$
$$x=\frac{\pi}{6},\frac{5\pi}{6}$$

The general solutions for the asymptotes are $\dfrac{\pi}{6}\pm 2n\pi,\ \dfrac{5\pi}{6}\pm 2n\pi$

The answer is **A**.

14.

$$\sec\left(x-\frac{\pi}{2}\right)$$
$$=\frac{1}{\cos\left(x-\frac{\pi}{2}\right)}$$
$$=\frac{1}{\cos x\cos\frac{\pi}{2}+\sin x\sin\frac{\pi}{2}}$$
$$=\frac{1}{\cos x(0)+\sin x(1)}$$
$$=\frac{1}{\sin x}$$
$$=\csc x$$

The answer is **C**.

NR #4) First simplify the expression using the identity $1+\cot^2 x = \csc^2 x$

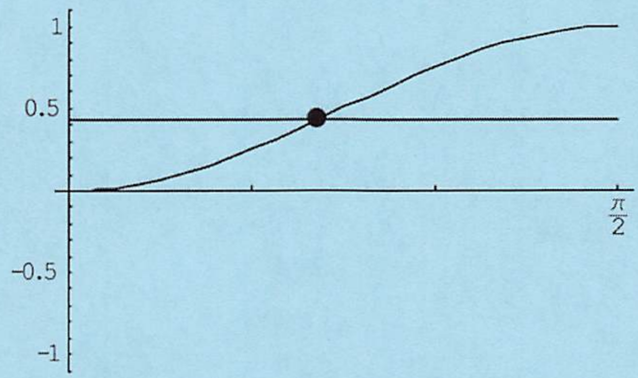
$$\frac{1}{1+\cot^2 x} = 0.43$$

$$\frac{1}{\csc^2 x} = 0.43$$

$$\frac{1}{\frac{1}{\sin^2 x}}$$

$$\sin^2 x = 0.43$$

Then solve by graphing over the interval $0 \le x < \frac{\pi}{2}$ (Make sure you're in radian mode)



The answer is **0.7**

15.

$$\frac{\sin x}{\tan x} + \frac{1}{\sec x}$$

$$\frac{\sin x}{\frac{\sin x}{\cos x}} + \frac{1}{\frac{1}{\cos x}}$$

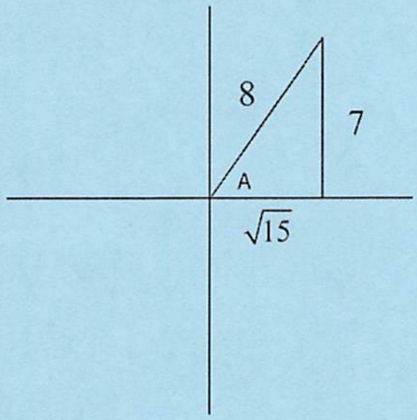
$$\sin x \bullet \frac{\cos x}{\sin x} + \cos x$$

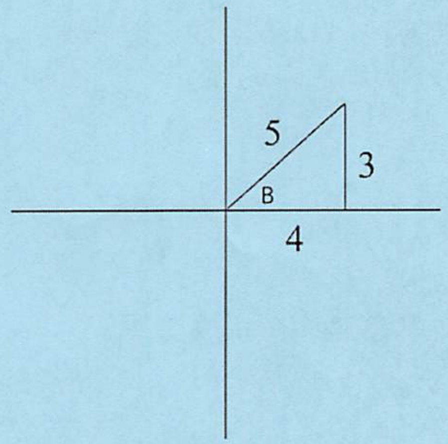
$$\cos x + \cos x$$

$$2\cos x$$

The answer is **A**

16. First draw out the two triangles, and use Pythagoras to determine the unknown side.





Now state what you know:

$\sin A = \frac{7}{8}$ $\sin B = \frac{3}{5}$

$\cos A = \frac{\sqrt{15}}{8}$ $\cos B = \frac{4}{5}$

Plug all of these into $\cos(A - B) = \cos A \cos B + \sin A \sin B$

$$\cos(A - B) = \cos A \cos B + \sin A \sin B$$
$$= \frac{\sqrt{15}}{8} \bullet \frac{4}{5} + \frac{7}{8} \bullet \frac{3}{5}$$
$$= \frac{4\sqrt{15}}{40} + \frac{21}{40}$$
$$= \frac{4\sqrt{15} + 21}{40}$$

The answer is **C**.

17. First use the identity $1 + \cot^2 x = \csc^2 x$

$$-5\csc^2 x + 12\cot^2 x - 9 = 0$$
$$-5\left(1 + \cot^2 x\right) + 12\cot^2 x - 9 = 0$$
$$-5 - 5\cot^2 x + 12\cot^2 x - 9 = 0$$
$$7\cot^2 x - 14 = 0$$
$$7\cot^2 x = 14$$

$\cot^2 x = 2$ The answer is **B**.

18. Expand $\cos(x-y)-\cos(x+y)$ using the sum & difference identities.

$$\cos x\cos y+\sin x\sin y-(\cos x\cos y-\sin x\sin y)$$
$$=\cos x\cos y+\sin x\sin y-\cos x\cos y+\sin x\sin y$$
$$=2\sin x\sin y$$

The answer is **A**.

19. When $\cos^2 x-\sin x$ intersects the line $y=\frac{1}{2}$, we can set the two equations equal to each other, then simplify.

$$\cos^2 x-\sin x=\frac{1}{2}$$
$$2\cos^2 x-2\sin x=1$$
$$2\cos^2 x-2\sin x-1=0$$

The answer is **B**.

20. The expression $\sin\left(\frac{\theta}{5}\right)\cos\left(\frac{2\theta}{7}\right)-\cos\left(\frac{\theta}{5}\right)\sin\left(\frac{2\theta}{7}\right)$ is generated using the identity $\sin(A-B)=\sin A\cos B-\cos A\sin B$

$$\sin(A-B)=\sin\left(\frac{\theta}{5}\right)\cos\left(\frac{2\theta}{7}\right)-\cos\left(\frac{\theta}{5}\right)\sin\left(\frac{2\theta}{7}\right)$$
$$A=\frac{\theta}{5}\quad B=\frac{2\theta}{7}$$

Now replace A & B on the ***left*** side:

$$\sin(A-B)=\sin\left(\frac{\theta}{5}-\frac{2\theta}{7}\right)$$
$$=\sin\left(\frac{7\theta}{35}-\frac{10\theta}{35}\right)$$
$$=\sin\left(-\frac{3\theta}{35}\right)$$

The answer is **D**.

21. Simplify the identity so it can be typed into the TI-83

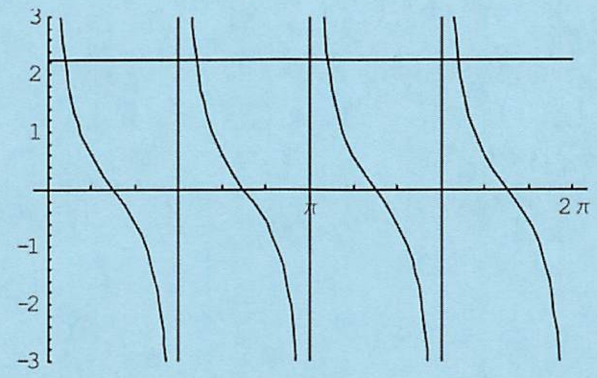
$$\frac{\csc 2x}{\sec 2x} = \sqrt{5}$$

$$\frac{\frac{1}{\sin 2x}}{\frac{1}{\cos 2x}} = \sqrt{5}$$

$$\frac{1}{\sin 2x} \bullet \cos 2x = \sqrt{5}$$

$$\frac{\cos 2x}{\sin 2x} = \sqrt{5}$$

Graph in your TI-83 to get the following:



The first point of intersection occurs at 0.21 radians, and there is a period of $\frac{\pi}{2} = 1.57$

The answer is **D**.

NR #5. Simplify each of the following

I $\frac{1}{9}\sec x \cos x = \frac{1}{9} \bullet \frac{1}{\cos x} \bullet \cos x = \frac{1}{9}$

II $\cot^2 x - \csc^2 x = \cot^2 x - \left(1 + \cot^2 x\right) = \cot^2 x - 1 - \cot^2 x = -1$

III $2\cos^2 x + 2\sin^2 x = 2\left(\cos^2 x + \sin^2 x\right) = 2\left(1\right) = 2$

IV $2\cot x - \frac{2\cos x}{\sin x} = \frac{2\cos x}{\sin x} - \frac{2\cos x}{\sin x} = 0$

The answer is **2413**

22. Use the identity $\cos 2x = \cos^2 x - \sin^2 x$

$$\cos 2x = \cos^2 x - \sin^2 x$$
$$= \left(1 - \sin^2 x\right) - \sin^2 x$$
$$= 1 - 2\sin^2 x$$
$$= 1 - 2m^2$$

The answer is **A.**

23.

$$\frac{1+\csc x}{\sin x} = \frac{1+\frac{1}{\sin x}}{\sin x}$$
$$= \frac{\frac{\sin x}{\sin x} + \frac{1}{\sin x}}{\sin x}$$
$$= \frac{\frac{\sin x + 1}{\sin x}}{\sin x}$$
$$= \frac{\sin x + 1}{\sin x} \bullet \frac{1}{\sin x}$$
$$= \frac{\sin x + 1}{\sin^2 x}$$

The answer is **C.**

24.

$$\frac{\cos(x+y)}{\cos y} = \frac{\cos x \cos y - \sin x \sin y}{\cos y}$$
$$\frac{\cos 45^0 \cos y - \sin 45^0 \sin y}{\cos y}$$
$$\frac{\frac{\sqrt{2}}{2}\cos y - \frac{\sqrt{2}}{2}\sin y}{\cos y}$$
$$\frac{\frac{\sqrt{2}}{2}\cos y}{\cos y} - \frac{\frac{\sqrt{2}}{2}\sin y}{\cos y}$$
$$\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}\tan y$$
$$\frac{\sqrt{2}}{2}(1 - \tan y)$$

The ánswer is **B**.

25. First determine the angle as a degree to make things easier: $\sec\left(-\frac{\pi}{12}\right) = \sec\left(-15^0\right)$

Then find two angles which give -15°: $\sec\left(-15^0\right) = \sec\left(30^0 - 45^0\right)$

$$\begin{aligned}
&\sec\left(30^0 - 45^0\right) \\
&= \frac{1}{\cos\left(30^0 - 45^0\right)} \\
&= \frac{1}{\cos 30^0 \cos 45^0 + \sin 30^0 \sin 45^0} \\
&= \frac{1}{\frac{\sqrt{3}}{2} \bullet \frac{\sqrt{2}}{2} + \frac{1}{2} \bullet \frac{\sqrt{2}}{2}} \\
&= \frac{1}{\frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4}} \\
&= \frac{1}{\frac{\sqrt{6}+\sqrt{2}}{4}} \\
&= \frac{4}{\sqrt{6}+\sqrt{2}}
\end{aligned}$$

Now rationalize the denominator

$$\begin{aligned}
&= \frac{4}{\sqrt{6}+\sqrt{2}} \bullet \frac{\sqrt{6}-\sqrt{2}}{\sqrt{6}-\sqrt{2}} \\
&= \frac{4\left(\sqrt{6}-\sqrt{2}\right)}{\left(\sqrt{6}+\sqrt{2}\right)\left(\sqrt{6}-\sqrt{2}\right)} \\
&= \frac{4\left(\sqrt{6}-\sqrt{2}\right)}{6-2} \\
&= \frac{4\left(\sqrt{6}-\sqrt{2}\right)}{4} \\
&= \sqrt{6}-\sqrt{2}
\end{aligned}$$

The answer is **B**.

NR 6. Compare $\cos^2 kx - \sin^2 kx$ with the identity $\cos(2A) = \cos^2 A - \sin^2 A$

In this identity, the right-side variables will be half the left-side variable.

Example: $\cos(8x) = \cos^2 4x - \sin^2 4x$

So, following that logic, $\cos(1x) = \cos^2 \frac{1}{2}x - \sin^2 \frac{1}{2}x$

The answer is **0.5**

26.

$\cos^2 x - \sin^2 x - 1 + 2\sin x$

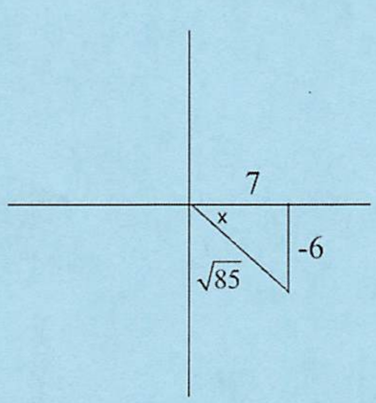
$\left(1 - \sin^2 x\right) - \sin^2 x - 1 + 2\sin x$

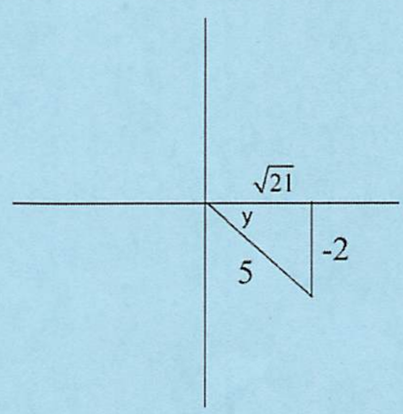
$2\sin x - 2\sin^2 x$

$2\sin x\left(1 - \sin x\right)$

The answer is **A**.

27. Draw in the triangles and use Pythagoras to solve for the unknown side





Now state what you know:

$\sin x = \dfrac{-6}{\sqrt{85}}$ $\qquad$ $\sin y = \dfrac{-2}{5}$

$\cos x = \dfrac{7}{\sqrt{85}}$ $\qquad$ $\cos y = \dfrac{\sqrt{21}}{5}$

$$\sec(x+y) = \frac{1}{\cos(x+y)}$$

$$\frac{1}{\cos(x+y)} = \frac{1}{\cos x \cos y - \sin x \sin y}$$

$$= \frac{1}{\frac{7}{\sqrt{85}} \bullet \frac{\sqrt{21}}{5} - \frac{-6}{\sqrt{85}} \bullet \frac{-2}{5}}$$

$$= \frac{1}{\frac{7\sqrt{21}}{5\sqrt{85}} - \frac{12}{5\sqrt{85}}}$$

$$= \frac{1}{\frac{7\sqrt{21} - 12}{5\sqrt{85}}}$$

$$= \frac{5\sqrt{85}}{7\sqrt{21} - 12}$$

The answer is D

28.

$$\csc x - \sin x$$

$$\frac{1}{\sin x} - \sin x$$

$$\frac{1}{\sin x} - \left(\frac{\sin^2 x}{\sin x}\right)$$ Get a common denominator

$$\frac{1-\sin^2 x}{\sin x}$$

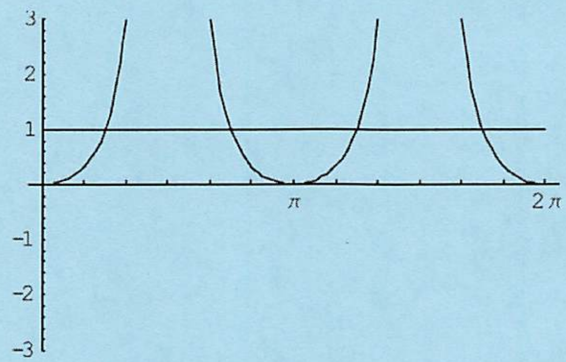
$$\frac{\cos^2 x}{\sin x}$$

$$\cos x\left(\frac{\cos x}{\sin x}\right)$$ Separate out to finish the question

$$\cos x \cot x$$

The answer is **D**.

NR 7. Graph the equation



The answer is **4**.

29.

$$\frac{\sin x+\tan x}{\cos x+1}$$

$$\frac{\sin x+\frac{\sin x}{\cos x}}{\cos x+1}$$

$$\frac{\frac{\sin x\cos x}{\cos x}+\frac{\sin x}{\cos x}}{\cos x+1}$$

$$\frac{\frac{\sin x\cos x+\sin x}{\cos x}}{\cos x+1}$$

$$\frac{\sin x\cos x+\sin x}{\cos x}\bullet\frac{1}{\cos x+1}$$

$$\frac{\sin x\left(\cos x+1\right)}{\cos x}\bullet\frac{1}{\cos x+1}$$

$$=\frac{\sin x}{\cos x}$$

$$=\tan x$$

The answer is **B**.

30.

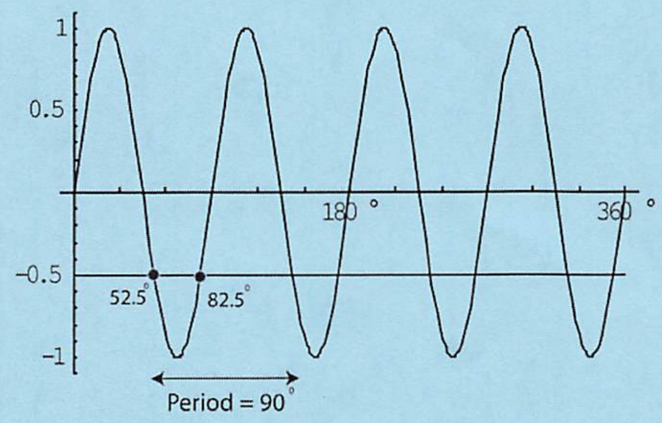
$$\csc^4 x-1$$

$$\left(\csc^2 x-1\right)\left(\csc^2 x+1\right)$$

$$\cot^2 x\left(\csc^2 x+1\right)$$

The answer is **C.**

31. Graph $\sin 4x = -\frac{1}{2}$ in degree mode



$$52.5^0 \bullet \frac{\pi}{180^0} = \frac{7\pi}{24}$$

$$82.5^0 \bullet \frac{\pi}{180^0} = \frac{11\pi}{24}$$

The general solutions are $\frac{7\pi}{24} \pm \frac{n\pi}{2}, \ \frac{11\pi}{24} \pm \frac{n\pi}{2}$

The answer is **C**.

32.

$\sec x = \frac{1}{\cos x}$ is undefined at $\frac{\pi}{2}, \frac{3\pi}{2}, \ldots$ since the denominator becomes zero at these values.

$\sec 2x = \frac{1}{\cos 2x}$ is undefined at $\frac{\pi}{4}, \frac{3\pi}{4}, \ldots$, since these angles will result in the denominator becoming zero.

The answer is **A.**

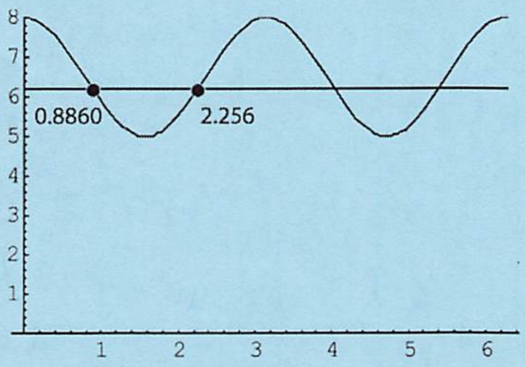
33. The reason no answer can be found is because the range of $y = \cos x$ exists only between -1 and 1, and there are no intersection points in the equations $\cos x = \sqrt{2}$ and $\cos x = -\sqrt{2}$.

The answer is **B.**

Written Response #1

- The equation $f(x) = 8 - 3\sin^2 x$ should be typed into the graphing calculator using $y_1 = 8 - 3(\sin(x))^2$
  Make sure calculator is in radian mode.
  Window Settings: Domain [-2π , 2π , $\frac{\pi}{2}$] Range [0 , 8 , 1]
  *There are multiple answers for the range, as long as the bottom and top of the graph can be seen clearly.

- Draw the graph $6.2 = 8 - 3(\sin(x))^2$ and find the intersection points.



The period is π = 3.14 radians.

The general solutions are

$0.89 + n\pi,\ \ n \in I$

$2.26 + n\pi,\ \ n \in I$

- State what you know from the graph:

$$a = \frac{|\max - \min|}{2} = \frac{|8-5|}{2} = \frac{3}{2} = 1.5$$

$$b = \frac{2\pi}{P} = \frac{2\pi}{\pi} = 2$$

$$c = 0$$

$$d = \frac{|\min + \max|}{2} = \frac{|5+8|}{2} = \frac{13}{2} = 6.5$$

The equation is $g(x) = 1.5\cos 2x + 6.5$

- $7 + \sin^2 x = 8 - 3\sin^2 x$

$$4\sin^2 x = 1$$

$$\sin^2 x = \frac{1}{4}$$

$$\sqrt{\sin^2 x} = \sqrt{\frac{1}{4}}$$

$$\sin x = \pm\frac{1}{2}$$

Use the unit circle to determine the correct angles.

$\sin x = \frac{1}{2}$ $\qquad$ $\sin x = -\frac{1}{2}$

$x = \frac{\pi}{6}, \frac{5\pi}{6}$ $\qquad$ $x = \frac{7\pi}{6}, \frac{11\pi}{6}$

Written Response #2

-

$\dfrac{\cos x}{1-\sin x}$	$\dfrac{1+\sin x}{\cos x}$
$\dfrac{\cos\frac{\pi}{6}}{1-\sin\frac{\pi}{6}}$	$\dfrac{1+\sin\frac{\pi}{6}}{\cos\frac{\pi}{6}}$
$\dfrac{\frac{\sqrt{3}}{2}}{1-\frac{1}{2}}$	$\dfrac{1+\frac{1}{2}}{\frac{\sqrt{3}}{2}}$
$\dfrac{\frac{\sqrt{3}}{2}}{\frac{1}{2}}$	$\dfrac{\frac{3}{2}}{\frac{\sqrt{3}}{2}}$
$\dfrac{\sqrt{3}}{\cancel{2}}\bullet\cancel{2}$	$\dfrac{3}{\cancel{2}}\bullet\dfrac{\cancel{2}}{\sqrt{3}}$
$\sqrt{3}$	$\dfrac{3}{\sqrt{3}}$
$\sqrt{3}$	$\dfrac{3}{\sqrt{3}}\bullet\dfrac{\sqrt{3}}{\sqrt{3}}$
$\sqrt{3}$	$\dfrac{\cancel{3}\sqrt{3}}{\cancel{3}}$
$\sqrt{3}$	$\sqrt{3}$

- The graphs are not identical because the graph of $y_1=\dfrac{\cos x}{1-\sin x}$ exists at $\dfrac{3\pi}{2}$, but the graph of $y_2=\dfrac{1+\sin x}{\cos x}$ is undefined at $\dfrac{3\pi}{2}$. This point discontinuity is not visible when you use the calculator.

If you go 2^{nd} → Trace → Value → $x=\dfrac{3\pi}{2}$, notice that you get zero for y_1, and no solution for y_2

- $$\begin{aligned}&\frac{\cos x}{1-\sin x}\\ &=\frac{\cos x}{1-\sin x}\bullet\frac{1+\sin x}{1+\sin x} \quad \text{Use conjugate}\\ &=\frac{\cos x(1+\sin x)}{(1-\sin x)(1+\sin x)}\\ &=\frac{\cos x(1+\sin x)}{1-\sin^2 x}\\ &=\frac{\cos x(1+\sin x)}{\cos^2 x}\\ &=\frac{1+\sin x}{\cos x}\end{aligned}$$

- $$\begin{aligned}&\frac{\cos x}{1-\sin x}+\frac{1+\sin x}{\cos x}\\ &=\frac{\cos x(\cos x)}{(1-\sin x)(\cos x)}+\frac{(1+\sin x)(1-\sin x)}{\cos x(1-\sin x)}\\ &=\frac{\cos^2 x}{\cos x(1-\sin x)}+\frac{1-\sin^2 x}{\cos x(1-\sin x)}\\ &=\frac{\cos^2 x}{\cos x(1-\sin x)}+\frac{\cos^2 x}{\cos x(1-\sin x)}\\ &=\frac{2\cos^2 x}{\cos x(1-\sin x)}\\ &=\frac{2\cos x}{(1-\sin x)}\end{aligned}$$

Written Response #3

- $$\frac{1+\cos 2x}{\sin 2x}$$
  $$=\frac{1+(2\cos^2 x-1)}{2\sin x\cos x}$$
  $$=\frac{2\cos^2 x}{2\sin x\cos x}$$
  $$=\frac{\cos x}{\sin x}$$
  $$=\cot x$$

- $$(\sin x+\cos x)^2$$
  $$=\sin^2 x+2\sin x\cos x+\cos^2 x$$
  $$=\sin^2 x+\cos^2 x+2\sin x\cos x$$
  $$=1+2\sin x\cos x$$

- $$\sin 2x=\sin(x+x)$$
  $$\sin(x+x)=\sin x\cos x+\cos x\sin x$$
  $$=2\sin x\cos x$$

- $$2\sin x\cos x-\cos x=0$$
  $$\cos x(2\sin x-1)=0$$
  $$x=\frac{\pi}{6},\frac{\pi}{2},\frac{5\pi}{6},\frac{3\pi}{2}$$

- $$3\sin x=2\sin x$$
  $$3\sin x-2\sin x=0$$
  $$\sin x=0$$
  $$x=0,\pi$$

- $$15\left(\frac{\csc x}{5}+\frac{\csc x}{3}\right)=15\left(\frac{16}{15}\right)$$
  $$3\csc x+5\csc x=16$$
  $$8\csc x=16$$
  $$\csc x=2$$
  $$\sin x=\frac{1}{2}$$
  $$x=\frac{\pi}{6},\frac{5\pi}{6}$$