Mathematics 3200

Test Unit IV

Name: _____

$$\tan(A+B)=\frac{\tan A+\tan B}{1-\tan A\tan B}$$

$$\tan(A-B)=\frac{\tan A-\tan B}{1+\tan A\tan B}$$

$$\sin(A+B)=\sin A\cos B+\cos A\sin B$$

$$\sin(A-B)=\sin A\cos B-\cos A\sin B$$

$$\cos(A+B)=\cos A\cos B-\sin A\sin B$$

$$\cos(A-B)=\cos A\cos B+\sin A\sin B$$

$$\sin^2\theta+\cos^2\theta=1$$

$$\cot^2\theta+1=\csc^2\theta$$

$$1+\tan^2\theta=\sec^2\theta$$

$$\sin 2A=2\sin A\cos A$$

$$\cos 2A=\cos^2 A-\sin^2 A$$

$$\cos 2A=1-2\sin^2 A$$

$$\cos 2A=2\cos^2 A-1$$

$$\tan 2A=\frac{2\tan A}{1-\tan^2 A}$$

Part A: Place the letter corresponding to the correct answer to each of the following in the blank at the right.

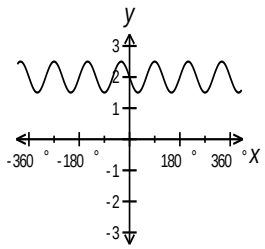
1. What is the period of $y = 4\cos\frac{1}{2}(x - 45°)$? 1. ____

(A) $\frac{\pi}{2}$ (B) π

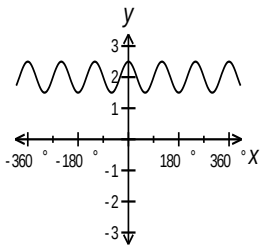
(C) 4π (D) 8π

2. Which graph best represents the sinusoidal function $y = -2\sin 3(x - 30°) - 2$? 2. ____

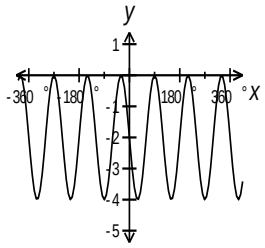
(A)



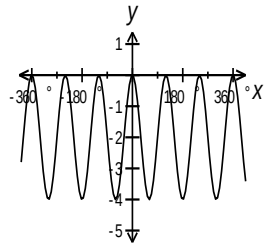
(B)



(C)



(D)



3. What is the range of the function $y = \frac{1}{4}\cos 2\left(x - \frac{\pi}{4}\right) - 3$? **3. ____**

(A) $\{y | -7 \le y \le 1, y \in R\}$ (B) $\{y | -\frac{13}{4} \le y \le -\frac{11}{4}, y \in R\}$

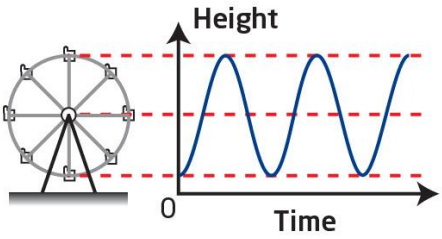
(C) $\{y | -1 \le y \le 7, y \in R\}$ (D) $\{y | \frac{11}{4} \le y \le \frac{13}{4}, y \in R\}$

4. What is the domain of $y = \tan x$? 4. ____

(A) $\left\{x | x \ne \frac{\pi}{4} + \pi n, n \in I, x \in R\right\}$ (B) $\left\{x | x \ne \frac{\pi}{4} + 2\pi n, n \in I, x \in R\right\}$

(C) $\left\{x | x \ne \frac{\pi}{4} + \pi n, n \in I, x \in R\right\}$ (D) $\left\{x | x \ne \frac{\pi}{4} + 2\pi n, n \in I, x \in R\right\}$

5. A Ferris wheel with a radius of 6 m rotates once every 30 seconds. Passengers get on board at a point 1 m above the ground at the bottom of the Ferris wheel. Which function models this situation? 5. ____



(A) $y = -6\cos\frac{\pi}{15}x + 7$ (B) $y = -6\cos\frac{15}{\pi}x + 7$

(C) $y = -\frac{1}{6}\cos\frac{\pi}{15}x + 7$ (D) $y = -\frac{1}{6}\cos\frac{\pi}{15}x + 7$

6. What are the non-permissible values of *x* for the equation $\sec x \cdot \sin x = \tan x$? 6. ____

(A) $x \neq 0 + \frac{\pi}{2}n, n \in I$ (B) $x \neq 0 + \pi n, n \in I$

(C) $x \neq \frac{\pi}{2} + \frac{\pi}{2}n, n \in I$ (D) $x \neq \frac{\pi}{2} + \pi n, n \in I$

7. Which is $2\sin\frac{\pi}{6}\cos\frac{\pi}{6}$ expressed as a single trigonometric function? 7. ____

(A) $\cos\frac{\pi}{3}$ (B) $\sin\frac{\pi}{3}$

(C) $1 - 2\sin^2\frac{\pi}{6}$ (D) $2\cos^2\frac{\pi}{6} - 1$

8. Which is a true identity? 8. ____

(A) $2\sin\theta = 1$ (B) $2\cos^2\theta - 1 = 0$

(C) $\sin\theta\cot\theta = \cos\theta$ (D) $\sin^2\theta = \cos^2\theta - 1$

9. Which is the simplified form of the trigonometric expression $\frac{\csc\theta - \sin\theta}{\cot^2\theta}$? 9. ____

(A) $-\tan^2\theta$ (B) $\frac{1}{1-\cos\theta}$

(C) $\frac{\cos^4\theta}{\sin^3\theta}$ (D) $\sin\theta$

10. What is the exact value of $\cos 75°$? 10. ___

(A) 0 (B) $\frac{1}{2}$

(C) $\frac{\sqrt{6}-\sqrt{2}}{4}$ (D) $\frac{\sqrt{6}+\sqrt{2}}{4}$

11. In which step is there an error when simplifying the expression : 11. ___

$$\frac{\tan x + \tan x \cos^2 x}{\sin^3 x}?$$

Step 1: $\frac{\tan x\left(1-\cos^2 x\right)}{\sin^3 x}$

Step 2: $\frac{\tan x\left(1-\cos^2 x\right)}{\left(1-\cos^2 x\right)\sin x}$

Step 3: $\frac{\tan x}{\sin x}$

Step 4: $\sec x$

(A) Step 1 (B) Step 2

(C) Step 3 (D) Step 4

12. Given that $\cos\theta = \frac{-5}{13}$, where $\frac{\pi}{2} \le \theta \le \pi$, what is the exact value of $\cos 2\theta$? 12. __

(A) $-\frac{120}{169}$ (B) $-\frac{119}{169}$

(C) $\frac{119}{169}$ (D) $\frac{120}{169}$

Part B : Answer each question and show all workings.

1. Determine all solutions, in radian measure, for the equation: $\sin\left[\frac{1}{2}\left(\theta-\frac{\pi}{2}\right)\right]=-\frac{\sqrt{2}}{2}$

2. $\angle A$ and $\angle B$ are both in Quadrant II, $\cos A=-\frac{5}{13}$ and $\sin B=\frac{3}{5}$. Determine the exact value of $\cos\left(A+B\right)$.

3. Verify the trigonometric identity: $\dfrac{\sin 2x}{1-\cos 2x} = \cot x$

4. Solve the trigonometric equation shown below for $0 \le x \le 2\pi$: $\sin 3x \cos x - \cos 3x \sin x = -\frac{\sqrt{3}}{2}$

5. Simplify : $\cos\left(\frac{3}{2}\pi + x\right) + \sin\left(\frac{3}{2}\pi + x\right)$

6. Prove : $\frac{\csc x}{\tan x + \cot x} = \cos x$

7. A Ferris Wheel has a diameter of 50 m and rotates once every 35 seconds. Mr. Math is presently sitting in a chair at the top of the Ferris Wheel, 53 metres above the ground. The wheel begins to move in a counter clockwise direction. Write an equation that expresses Mr. Math's height as of function of time for the rotation of his ride on the Ferris Wheel.

8. Solve : $\cos x \cdot \sin 2x + \cos x = 0$ *where* $[0, 2\pi)$