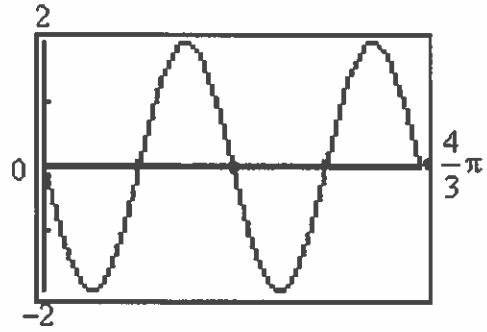
Test 4

Name Solutions

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Answer the question.

1) Which one of the equations below matches the graph? 1) A



A) $y = -2\sin(3x)$ B) $y = -2\cos(3x)$ C) $y = -2\sin\left(\frac{1}{3}x\right)$ D) $y = 2\sin\left(\frac{1}{3}x\right)$

Complete the identity.

2) $\frac{1}{\cos^2\theta} - \frac{1}{\cot^2\theta} = ?$ 2) C

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

A) $-\sec^2\theta$ B) $1 - \sin\theta$ C) 1 D) 0

Find the exact value of the expression.

3) $\sin(\tan^{-1} 2)$ 3) C

A) $5\sqrt{2}$ B) $2\sqrt{5}$ C) $\frac{2\sqrt{5}}{5}$ D) $\frac{5\sqrt{2}}{2}$

4) $\sin\frac{11\pi}{12} = \sin(\pi - \pi/12) = \sin\pi/12 = \sin(\pi/4 - \pi/6) = \sin\pi/4\cos\pi/6 - \sin\pi/6\cos\pi/4.$ 4) C

A) $-\frac{\sqrt{2}(\sqrt{3}-1)}{4}$ B) $\sqrt{2}(\sqrt{3}-1)$ C) $\frac{\sqrt{2}(\sqrt{3}-1)}{4}$ D) $-\sqrt{2}(\sqrt{3}-1)$

$\frac{\sqrt{2}}{2}\frac{\sqrt{3}}{2} - \frac{1}{2}\frac{\sqrt{2}}{2}$

$\frac{\sqrt{6}-\sqrt{2}}{4}$

Find the exact value of the expression. Do not use a calculat (No Decimal).

5) $\cos\frac{\pi}{3} + \tan\frac{5\pi}{3}$ 5) B

A) $\frac{\sqrt{3}+1}{2}$ B) $\frac{1-2\sqrt{3}}{2}$ C) $\frac{2\sqrt{3}+3}{6}$ D) $\frac{\sqrt{3}+3}{3}$

$\frac{1}{2} + \tan(2\pi - \pi/3) = \frac{1}{2} - \tan\pi/3 = \frac{1}{2} - \sqrt{3} = \frac{1-2\sqrt{3}}{2}$

$\frac{5\pi}{3} = 2\pi - \frac{\pi}{3}$

Find the exact value of the expression. Do not use a calculator.

6) $\sin^{-1}\left[\sin\left(\frac{6\pi}{7}\right)\right]$ $= \sin^{-1}\left(\sin(\pi - \pi/7)\right) = \sin^{-1}\left(\sin \pi/7\right) =$ 6) B

A) $\frac{6\pi}{7}$ B) $\frac{\pi}{7}$ C) $\frac{7}{\pi}$ D) $\frac{7}{6\pi}$

Find the exact value of the expression.

7) $\tan\left(\sin^{-1}\frac{\sqrt{2}}{2}\right) = \tan \pi/4$ 7) C

A) $\frac{\sqrt{2}}{2}$ B) $\sqrt{2}$ C) 1 D) 2

In the problem, sin θ and cos θ are given. Find the exact value of the indicated trigonometric function.

8) $\sin\theta = \frac{1}{4}$, $\cos\theta = \frac{\sqrt{15}}{4}$ Find csc θ. $= \frac{1}{\sin\theta} = \frac{1}{1/4}$ 8) D

A) $\frac{\sqrt{15}}{15}$ B) $\sqrt{15}$ C) $\frac{4\sqrt{15}}{15}$ D) 4

In the problem, t is a real number and P = (x, y) is the point on the unit circle that corresponds to t. Find the exact value of the indicated trigonometric function of t.

9) $\left(-\frac{\sqrt{65}}{9}, -\frac{4}{9}\right)$ Find sin t. 9) C

A) $\frac{9}{4}$ B) $-\frac{\sqrt{65}}{9}$ C) $-\frac{4}{9}$ D) $-\frac{9\sqrt{65}}{65}$

Simplify the expression.

10) $\frac{\cos\theta}{1+\sin\theta} + \tan\theta = \frac{\cos\theta + \tan\theta + \frac{\sin^2\theta}{\cos\theta}}{1+\sin\theta}$ $\frac{\cos\theta}{1+\sin\theta} + \frac{\sin\theta}{\cos\theta} = \frac{(1+\sin\theta)}{(1+\sin\theta)\cos\theta}$ 10) B

A) 1 B) sec θ C) cos θ + sin θ D) $\sin^2\theta$

$\frac{\cos^2\theta + \sin^2\theta + \sin\theta}{(1+\sin\theta)\cos\theta}$

Solve the equation on the interval $0 \le \theta < 2\pi$.

11) $2\sqrt{3}\sin(4\theta) = 3$ $\sin 4\theta = \frac{\sqrt{3}}{2}$ 11) D

A) $\frac{\pi}{4}, \frac{5\pi}{4}$ B) 0

C) $0, \frac{\pi}{4}, \pi$ $4\theta = \pi/3 + 2n\pi$ D) $\frac{\pi}{12}, \frac{\pi}{6}, \frac{2\pi}{3}, \frac{7\pi}{12}, \frac{7\pi}{6}, \frac{13\pi}{12}, \frac{5\pi}{3}, \frac{19\pi}{12}$

$4\theta = \frac{2\pi}{3} + 2n\pi$

12) $\sin(2\theta) + \sin\theta = 0$ 12) A

A) $0, \frac{2\pi}{3}, \pi, \frac{4\pi}{3}$ B) $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$ C) $\frac{\pi}{8}, \frac{9\pi}{8}$ D) No solution

$2\sin\theta\cos\theta + \sin\theta = 0 \longrightarrow \sin\theta(2\cos\theta + 1) = 0$

Find the exact value of the expression.

13) $\sin\frac{\pi}{12} = \sin(\pi/4 - \pi/6)$ 13) C

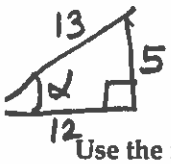
A) $-\frac{\sqrt{2}(\sqrt{3}-1)}{4}$ B) $\sqrt{2}(\sqrt{3}-1)$ C) $\frac{\sqrt{2}(\sqrt{3}-1)}{4}$ D) $-\sqrt{2}(\sqrt{3}-1)$

14) $\frac{\tan 5° + \tan 25°}{1 - \tan 5° \tan 25°}$ = $\tan 30° = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$ 14) C

A) $\frac{1}{2}$ B) $\sqrt{3}$ C) $\frac{\sqrt{3}}{3}$ D) 2

Find the exact value under the given conditions.

15) $\cos\alpha = -\frac{12}{13}$, $\frac{\pi}{2} < \alpha < \pi$; $\sin\beta = \frac{15}{17}$, $\frac{\pi}{2} < \beta < \pi$ Find $\tan(\alpha - \beta)$. = $\frac{\tan\alpha - \tan\beta}{1 + \tan\alpha\tan\beta}$ 15) $\frac{-\frac{5}{12} - \frac{-15}{8}}{1 + \frac{5}{12}\cdot\frac{15}{8}}$



A) $\frac{772}{171}$ α QIII B) $-\frac{20}{3}$ 

C) $\frac{140}{171}$ D) $\frac{20}{3}$

Use the information given about the angle θ, $0 \le \theta \le 2\pi$, to find the exact value of the indicated trigonometric function.

16) $\sin\theta = \frac{7}{25}$, $0 < \theta < \frac{\pi}{2}$ Find $\cos(2\theta)$. = $1 - 2\sin^2\theta = 1 - 2\frac{49}{625}$ 16) A

A) $\frac{527}{625}$ B) $\frac{336}{625}$ C) $-\frac{527}{625}$ D) $\frac{529}{625}$

Complete the identity.

17) $\cos(4\theta) = ?$ Done in class 17) A

A) $\cos^4\theta - 6\sin^2\theta\cos^2\theta + \sin^4\theta$ B) $3\sin\theta - 4\sin^3\theta$

C) $4\sin\theta\cos^3\theta - 4\sin^3\theta\cos\theta$ D) $\cos^3\theta - 3\sin^2\theta\cos\theta$

Use the information given about the angle θ, $0 \le \theta \le 2\pi$, to find the exact value of the indicated trigonometric function.

18) $\sin\theta = \frac{1}{4}$, $0 < \theta < \frac{\pi}{2}$ Find $\sin\frac{\theta}{2}$. = $\sqrt{\frac{1-\cos\theta}{2}} = \sqrt{\frac{1-\frac{\sqrt{15}}{4}}{2}}$ 18) A

A) $\frac{\sqrt{8-2\sqrt{15}}}{4}$ B) $\frac{\sqrt{8+2\sqrt{15}}}{4}$ C) $\frac{\sqrt{6}}{4}$ D) $\frac{\sqrt{10}}{4}$

$\sqrt{\frac{4-\sqrt{15}}{8\cdot 2}} = \frac{\sqrt{8-2\sqrt{15}}}{4}$

Express the product as a sum containing only sines or cosines.

19) $\sin(7\theta)\cos(3\theta)$ = $\frac{1}{2}[\sin(10\theta) + \sin(4\theta)]$. 19) B

A) $\sin\cos(21\theta^2)$ B) $\frac{1}{2}[\sin(10\theta) + \sin(4\theta)]$

C) $\frac{1}{2}[\sin(10\theta) + \cos(4\theta)]$ D) $\frac{1}{2}[\cos(10\theta) - \cos(4\theta)]$

Solve the equation on the interval $0 \le \theta < 2\pi$.

20) $\csc(3\theta) = 0$ 20) D

A) $0, \frac{2\pi}{3}, \pi, \frac{4\pi}{3}$ B) $\frac{\pi}{8}, \frac{9\pi}{8}$ C) $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$ D) No solution

Write the trigonometric expression as an algebraic expression in u.

21) $\sin(\tan^{-1} u)$ 21) B

A) $\frac{1}{\sqrt{u^2+1}}$ B) $\frac{u}{\sqrt{u^2+1}}$ C) $\frac{u}{\sqrt{u^2-1}}$ D) $u\sqrt{u^2+1}$

Solve the problem.

22) A weight suspended from a spring is vibrating vertically with up being the positive direction. The function

$$f(t) = 10 \sin\left(\frac{3\pi t}{4} - \frac{\pi}{4}\right)$$

$5 = 10 \sin\left(\frac{3\pi t}{4} - \frac{\pi}{4}\right) \rightarrow t =$

represents the distance in centimeters of the weight from its rest position as a function of time t, where t is measured in seconds. Find the smallest positive value of t for which the displacement of the weight above its rest position is 5 cm. Round answer to three decimal places, if necessary.

A) 0.222 B) 0.556 C) 2.293 D) 1.586

22) B

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

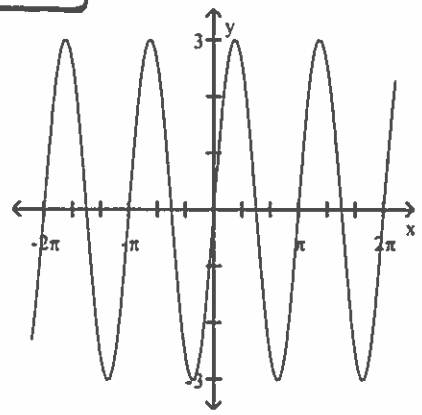
Match the given function to its graph.

23) 1) $y = 3 \sin(2x)$ 2) $y = 3 \sin(\frac{1}{2}x)$

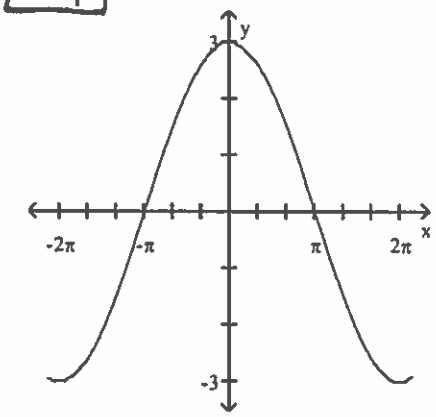
3) $y = 3 \cos(2x)$ 4) $y = 3 \cos(\frac{1}{2}x)$

23) _____

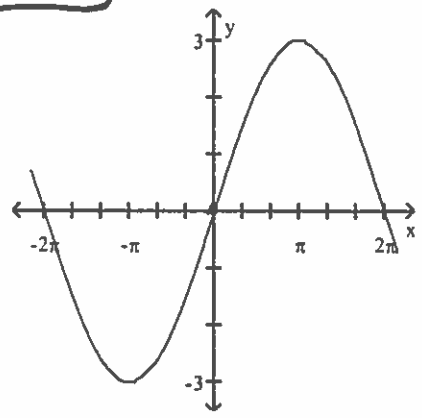
A 1



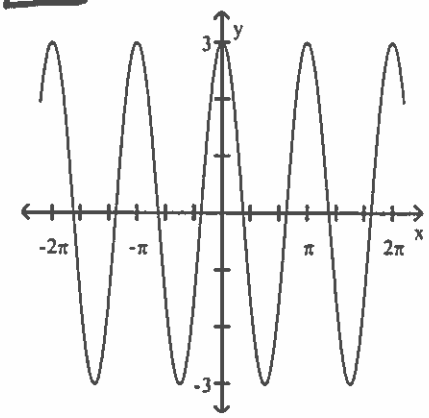
B 4



C 2



D 3



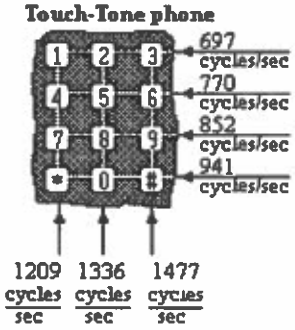
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve the problem.

24) On a Touch-Tone phone, each button produces a unique sound. The sound produced is the sum of two tones, given by

$y = \sin(2\pi lt)$ and $y = \sin(2\pi ht)$

where l and h are the low and high frequencies (cycles per second) shown on the illustration. 24) B



The sound produced is thus given by

$y = \sin(2\pi lt) + \sin(2\pi ht)$ ✔

Write the sound emitted by touching the # key as a product of sines and cosines.

A) $y = 2\sin(2150\pi t)\cos(268\pi t)$ (B) $y = 2\sin(2418\pi t)\cos(536\pi t)$

C) $y = 2\sin(536\pi t)\cos(2418\pi t)$ D) $y = 2\sin(268\pi t)\cos(2150\pi t)$

25) The blade of a windshield wiper sweeps out an angle of 135° in one cycle. The base of the blade is 12 inches from the pivot point and the tip is 32 inches from the pivot point. What area does the wiper cover in one cycle? (Round to the nearest 0.1 square inch.) 25) _____

A) 1105.3 in^2 B) 1041.8 in^2 C) 948.3 in^2 D) 1036.7 in^2

Area of sector = part of area of circle.

$= \frac{\theta}{2\pi} \cdot \pi r^2$ $\frac{135^\circ}{360} \cdot \pi r^2$

$= \frac{1}{2}\theta r^2$