

Name: Last _____, First _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question**Find the exact value of the expression.**

1) $\tan^{-1} 1$ 1) _____
 A) $\frac{2\pi}{3}$ B) $\frac{\pi}{4}$ C) $\frac{\pi}{3}$ D) $\frac{5\pi}{4}$

2) $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ 2) _____
 A) $\frac{\pi}{6}$ B) $\frac{5\pi}{6}$ C) $\frac{2\pi}{3}$ D) $-\frac{3\pi}{4}$

3) $\sin^{-1}(0.5)$ 3) _____
 A) $\frac{\pi}{3}$ B) $\frac{7\pi}{6}$ C) $\frac{\pi}{6}$ D) $\frac{7\pi}{3}$

Use a calculator to find the value of the expression rounded to two decimal places.

4) $\sin^{-1}\left(\frac{1}{4}\right)$ 4) _____
 A) 1.32 B) 14.48 C) 0.25 D) 75.52

5) $\cos^{-1}\left(\frac{4}{7}\right)$ 5) _____
 A) 55.15 B) 34.85 C) 0.61 D) 0.96

Find the exact value, if any, of the composite function. If there is no value, say it is "not defined". Do not use a calculator

6) $\cos[\cos^{-1}(-1.8)]$ 6) _____
 A) 1.8 B) 0.8 C) -1.8 D) not defined

7) $\tan(\tan^{-1}8)$ 7) _____
 A) 1 B) 8 C) -8 D) not defined

Find the inverse function f^{-1} of the function f .

8) $f(x) = -6 \cos(10x + 7)$ 8) _____
 A) $f^{-1}(x) = -\frac{1}{10}\left[\cos^{-1}\left(\frac{x}{6}\right) + 7\right]$ B) $f^{-1}(x) = -6 \cos^{-1}(10x + 7)$
 C) $f^{-1}(x) = \frac{1}{10}\left[\cos^{-1}\left(\frac{x}{6}\right) - 7\right]$ D) $f^{-1}(x) = \frac{1}{6}\left[\cos^{-1}\left(\frac{x}{10}\right) - 7\right]$

9) $f(x) = -\sin(x + 4) - 2$ 9) _____
 A) $f^{-1}(x) = \sin^{-1}(x + 2) - 4$ B) $f^{-1}(x) = -\sin^{-1}(x + 4) - 2$
 C) $f^{-1}(x) = -\sin^{-1}(x + 2) - 4$ D) $f^{-1}(x) = -\sin^{-1}(x - 2) + 4$

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

Solve the problem.

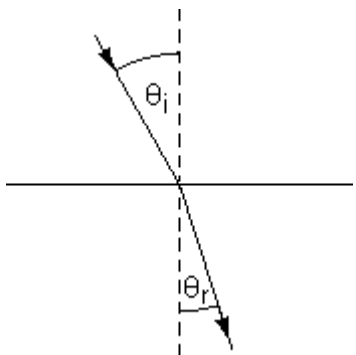
- 10) When light travels from one medium to another—from air to water, for instance—it changes direction. (This is why a pencil, partially submerged in water, looks as though it is bent.) The angle of incidence θ_i is the angle in the first medium; the angle of refraction θ_r is the second medium. (See illustration.) Each medium has an index of refraction— n_i and n_r , respectively—which can be found in tables. Snell's law relates these quantities in the formula

$$n_i \sin \theta_i = n_r \sin \theta_r$$

Solving for θ_r , we obtain

$$\theta_r = \sin^{-1} \left(\frac{n_i}{n_r} \sin \theta_i \right)$$

Find θ_r for air ($n_i = 1.0003$), methylene iodide ($n_r = 1.74$), and $\theta_i = 14.7^\circ$.



Simplify the trigonometric expression by following the indicated direction.

- 11) Factor and simplify: $\frac{2 \sin^2 \theta + 3 \sin \theta + 1}{\sin^2 \theta - 1}$ 11) _____

Establish the identity.

- 12) $\tan \theta \cdot \csc \theta = \sec \theta$ 12) _____

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

Simplify the expression.

- 13) $\frac{\cos \theta}{1 + \sin \theta} + \tan \theta$ 13) _____
A) $\sin^2 \theta$ B) 1 C) $\sec \theta$ D) $\cos \theta + \sin \theta$

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

Show that the functions f and g are identically equal.

- 14) $f(\theta) = \csc \theta + \cot \theta$, $g(\theta) = \frac{\sin \theta}{1 - \cos \theta}$ 14) _____

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

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

15) $2 \cos \theta + 1 = 0$

- A) $\frac{3\pi}{2}$ B) $\frac{\pi}{2}, \frac{3\pi}{2}$ C) $\frac{2\pi}{3}, \frac{4\pi}{3}$ D) $\frac{\pi}{3}, \frac{5\pi}{3}$

15) _____

16) $2 \cos^2 \theta - 1 = 0$

- A) $\frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$ B) $\frac{\pi}{4}, \frac{7\pi}{4}$
C) $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$ D) $\frac{\pi}{3}, \frac{5\pi}{3}$

16) _____

Solve the equation. Give a general formula for all the solutions.

17) $\tan \theta = -1$

- A) $\left\{ \theta \mid \theta = \frac{3\pi}{4} + 2k\pi \right\}$ B) $\left\{ \theta \mid \theta = \frac{3\pi}{4} + k\pi \right\}$
C) $\left\{ \theta \mid \theta = \frac{5\pi}{4} + 2k\pi \right\}$ D) $\left\{ \theta \mid \theta = \frac{5\pi}{4} + k\pi \right\}$

17) _____

Use a calculator to solve the equation on the interval $0 \leq \theta < 2\pi$. Round the answer to two decimal places.

18) $\tan \theta = 3.2$

- A) 1.27, 5.02 B) 1.27, 1.87 C) 1.27, 4.41 D) 1.27, 2.84

18) _____

19) $8 \sin \theta + 3 = 0$

- A) 1.96, 4.33 B) 1.96, 5.10 C) 2.76, 5.90 D) 3.53, 5.90

19) _____

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

20) $\sin^2 \theta + \sin \theta = 0$

- A) $0, \pi, \frac{\pi}{3}, \frac{5\pi}{3}$ B) $0, \pi, \frac{\pi}{3}, \frac{2\pi}{3}$ C) $0, \pi, \frac{3\pi}{2}$ D) $0, \pi, \frac{4\pi}{3}, \frac{5\pi}{3}$

20) _____

21) $2 \cos^2 \theta - 3 \cos \theta + 1 = 0$

- A) $\frac{\pi}{3}, \frac{\pi}{2}, \frac{5\pi}{3}$ B) $0, \frac{\pi}{6}, \frac{11\pi}{6}$ C) $0, \frac{\pi}{3}, \frac{2\pi}{3}$ D) $0, \frac{\pi}{3}, \frac{5\pi}{3}$

21) _____

Find the real zeros of the trigonometric function on the interval $0 \leq x < 2\pi$

22) $f(x) = 4 \cos^2 x - 3$

- A) $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$ B) $\frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$
C) $\frac{\pi}{3}, \frac{5\pi}{3}$ D) $\frac{\pi}{6}, \frac{11\pi}{6}$

22) _____

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

Solve the problem.

23) A water wheel rotates through the angle θ , the water level L behind the wheel changes according to the equation 23) _____

$$L = 1 - \sin \theta - 2 \cos^2 \theta$$

where L is measured in inches. Determine the values of θ for which the water level is zero. Find the exact values. Do not use a calculator.

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

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

24) $\cos^2 \theta - \sin^2 \theta = 1 + \sin \theta$ 24) _____

A) $0, \frac{\pi}{6}, \frac{5\pi}{6}, \pi$

B) $0, \pi, \frac{4\pi}{3}, \frac{5\pi}{3}$

C) $0, \pi, \frac{7\pi}{6}, \frac{11\pi}{6}$

D) $\frac{\pi}{2}, \frac{7\pi}{6}, \frac{3\pi}{2}, \frac{11\pi}{6}$

25) $\sin^2 \theta = 5(\cos \theta + 1)$ 25) _____

A) 0

B) $\frac{3\pi}{2}$

C) π

D) No solution

Solve the problem.

26) An electric generator produces a 30-cycle alternating current described by the equation 26) _____

$$I(t) = 40 \sin 60\pi \left(t - \frac{1}{120} \right)$$

where $I(t)$ amperes is the current at t seconds. Find the smallest value of t for which the current is 20 amperes.

A) $\frac{1}{30}$

B) $\frac{1}{60}$

C) $\frac{1}{120}$

D) $\frac{1}{90}$

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

Use a calculator to solve the equation. Round the solution(s) to two decimal places if necessary.

27) $x^2 - 3 \sin(2x) = 2x$ 27) _____

28) $e^x = \cos x$ 28) _____

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

Use a graphing utility to solve the equation on the interval $0^\circ \leq x < 360^\circ$. Express the solution(s) rounded to one decimal place.

29) $\sin^2 x + 8 \sin x - 4 = 0$ 29) _____

A) $28.2^\circ, 151.8^\circ$

B) $208.2^\circ, 331.8^\circ$

C) $28.2^\circ, 151.8^\circ, 208.2^\circ, 331.8^\circ$

D) No solution

30) $\tan^2 x + 5 \tan x + 3 = 0$ 30) _____

A) $103.1^\circ, 145.1^\circ, 283.1^\circ, 325.1^\circ$

B) $70.5^\circ, 109.5^\circ, 180.0^\circ$

C) $51.8^\circ, 128.2^\circ$

D) $49.8^\circ, 130.2^\circ, 229.8^\circ, 310.2^\circ$

Answer Key

Testname: MATH 1113 Q3-PRACTICE

1) B

2) B

3) C

4) C

5) D

6) D

7) B

8) C

9) C

10) $\theta_r = 8.39^\circ$

11) $\frac{2 \sin \theta + 1}{\sin \theta - 1}$

12) $\tan \theta \cdot \csc \theta = \frac{\sin \theta}{\cos \theta} \cdot \frac{1}{\sin \theta} = \frac{1}{\cos \theta} = \sec \theta$

13) C

14) $g(\theta) = \frac{\sin \theta}{1 - \cos \theta} = \frac{\sin \theta}{1 - \cos \theta} \cdot \frac{1 + \cos \theta}{1 + \cos \theta} = \frac{\sin \theta(1 + \cos \theta)}{1 - \cos^2 \theta} = \frac{\sin \theta(1 + \cos \theta)}{\sin^2 \theta} = \frac{1 + \cos \theta}{\sin \theta} = \frac{1}{\sin \theta} + \frac{\cos \theta}{\sin \theta} = \csc \theta + \cot \theta$
= f(θ)

15) C

16) C

17) B

18) C

19) D

20) C

21) D

22) A

23) $\theta = \frac{\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6}$

24) C

25) C

26) D

27) 0, 1.66

28) 0

29) A

30) A