MTH 123 (Trigonometry) Proficiency Test
Practice Exam
(created winter 2010, revised spring 2010)

To demonstrate proficiency in MTH 123, a student must successfully solve problems that deal with the following topics: trigonometric functions with an emphasis on graphing, identities, inverse trigonometric functions, solving trigonometric equations, solving triangles, vectors, complex numbers, and polar coordinates.
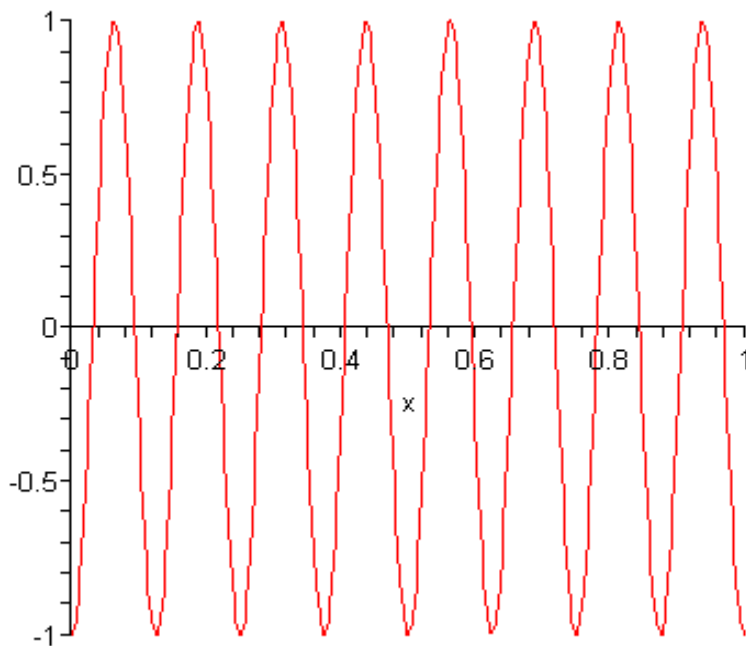
Answers to these problems are at the end of this document. You can use a calculator on this exam.

1. If $\cos x = -\dfrac{2}{3}$ and $\sin x < 0,$ find $\sin x.$

A) $-\dfrac{\sqrt{5}}{9}$ B) $-\dfrac{5}{9}$ C) $-\dfrac{\sqrt{5}}{3}$ D) $-\dfrac{1}{3}$ E) $-\dfrac{\sqrt{14}}{9}$

2. The following graph contains the pure form of a 8 Hz (cycles per second) wave for a time interval of one second. What is the period?

A) 0.125   B) 8   C) $\pi/4$ D) $4/\pi$ E) 2

3. Convert $\dfrac{7\pi}{6}$ to degrees.

A) 30° B) 150° C) 210° D) –30° E) 135°

4. If $f(x) = \sin 2x$, find $f\left(\dfrac{5\pi}{6}\right)$.

A) $\dfrac{\sqrt{3}}{2}$ B) $-\dfrac{\sqrt{2}}{2}$ C) 0.09 D) $-\dfrac{\sqrt{3}}{2}$ E) $-\dfrac{1}{2}$

5. Find $\cot\left(\dfrac{\pi}{2}\right)$.

A) 1 B) 0 C) undefined D) –1 E) None of these.

6. $\cos\left(\dfrac{\pi}{2} - \theta\right) =$

A) $\cos(-\theta)$ B) $\sin(\theta)$ C) $\sin(-\theta)$ D) $1 + \cos(-\theta)$ E) None of these.

7. If you are solving the SSA (side, side, angle) case of a triangle where none of the angles are 90 degrees, how many solutions for the triangle are possible?

A) 0 only B) 1 only C) 2 only D) 0 or 1 only E) 0, 1 or 2.

8. $\cot^2\theta \sin\theta \sec\theta =$

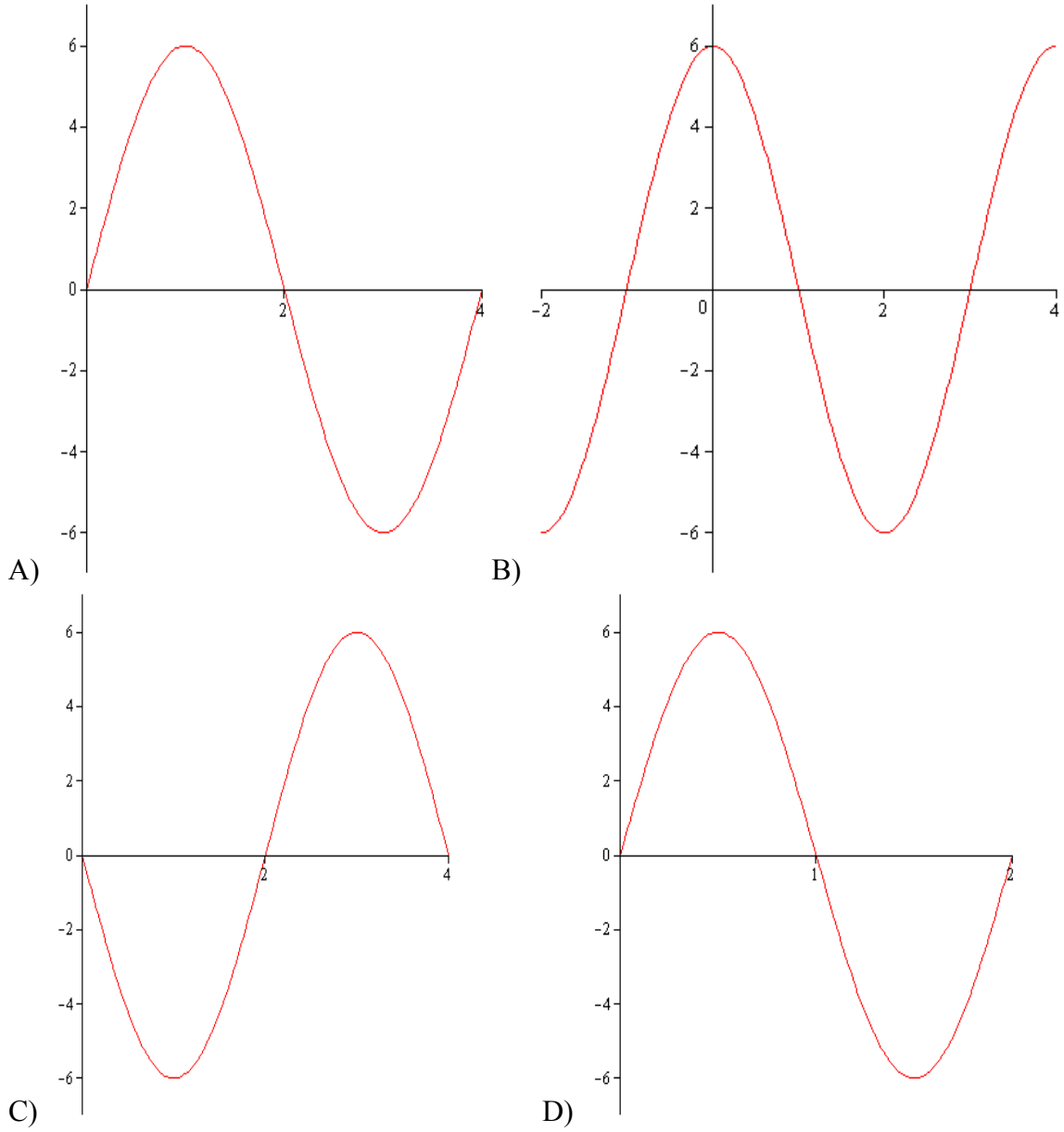A) $\sin\theta$ B) $\cot\theta$ C) $\tan\theta$ D) $\cot^2\theta$ E) $\sin^2\theta$

9. Solve $(2\cos x - 1)(\cos x + 1) = 0$ in the interval $0 < x \le 360°$.

A) 30°, 270° B) 45°, 90° C) 30°, 150° D) 30°, 210° E) 60°, 180°, 300°
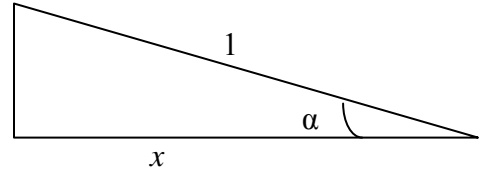
10. $\tan^2\theta - \sec^2\theta =$
A) 1 B) $\cos^2\theta$ C) –1 D) $\csc^2\theta$ E) none of these

11. Which of the following graphs best represents the graph of one cycle of $f(x) = 6\sin(0.5\pi x)$?

A)

B)

C)

D)

E) None of these.

12. In the right triangle shown, find the $\sin \alpha$.
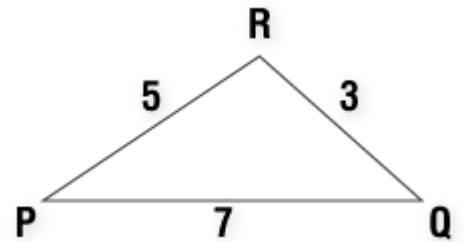

A) x B) $\sqrt{x^2 - 1}$ C) $\sqrt{1 - x^2}$ D) $1 - x^2$ E) $\dfrac{1}{x}$

13. Recall that for the triangle ABC, the law of cosines states that

$$c^2 = a^2 + b^2 - 2ab \cos C.$$

In the triangle shown in the figure to the right,
find the measure of angle R. Note: The figure is not drawn to scale.

A) 60°   B) 120°   C) 145°   D) 2.09°   E) 90°

14. Find all solutions to: $\sin x = -\dfrac{\sqrt{2}}{2}$ if $0 < x \le 2\pi$

A) $-\dfrac{\pi}{4}$ B) $\dfrac{5\pi}{4}, \dfrac{7\pi}{4}$ C) $\dfrac{\pi}{3}, \dfrac{5\pi}{3}$ D) $\pi, 2\pi$ E) none of these

15. Use your calculator to find an approximation of $\csc^{-1}(-1.73)$ rounded to four decimal places.

A) 2.1871   B) 0.6163   C) –0.6163   D) –0.5780   E) Undefined

16. Find the measure of the central angle, in degrees, that intercepts an arc of length 16 feet on a circle of radius 6 feet.

A) 152.79°   B) 480°   C) 0.047°   D) 2.67°   E) 125°

17. Find all solutions to $\sin 3x = 1$, if $0 < x \le \pi$:

A) $\dfrac{\pi}{2}$ B) $\dfrac{\pi}{6}$ C) $\dfrac{\pi}{2}, \dfrac{5\pi}{2}$ D) $\dfrac{\pi}{6}, \dfrac{5\pi}{6}$ E) $\dfrac{5\pi}{6}$

18. The graph of $f(x) = 5\sin(2(x-1))$ is obtained from the graph of $y = \sin x$ by:

A) Shifting left 2 units and down 1 unit.
B) Shifting right 1 unit and up 5 units.
C) Stretching vertically by a factor of 2, horizontally by a factor of 5 and down 1.
D) Shifting right 5 units and stretching vertically by a factor of 2.
E) Vertical stretch by a factor of 5, horizontal shrink by a factor of 2 and a phase shift of 1 unit right.

19. Convert the polar coordinates (4, 150°) to rectangular coordinates.
A) $(-2\sqrt{2}, 2\sqrt{2})$
B) $(-2, -2\sqrt{3})$
C) $(-2, 2\sqrt{3})$
D) $(-2\sqrt{3}, 2)$
E) $(2, -2\sqrt{2})$

20. What is the magnitude of $\vec{v} = 2\vec{i} - 3\vec{j}$?

A) -1 B) $\sqrt{13}$ C) $\sqrt{-5}$ D) 13   E) $-3/2$

ANSWERS to MTH 123 Proficiency Practice:

1. C
2. A
3. C
4. D
5. B
6. B
7. E
8. B
9. E
10. C
11. A
12. C
13. B
14. B
15. C
16. A
17. D
18. E
19. D
20. B