

College Algebra

1. What is the next term in the geometric sequence $16, -4, 1, -\frac{1}{4}, \dots$?
- A. $-\frac{1}{8}$
 B. 0
 C. $\frac{1}{16}$
 D. $\frac{1}{8}$
 E. $\frac{1}{2}$
2. A manufacturing company processes raw ore. The number of tons of refined material the company can produce during t days using Process A is $A(t) = t^2 + 2t$ and using Process B is $B(t) = 10t$. The company has only 7 days to process ore and must choose 1 of the processes. What is the maximum output of refined material, in tons, for this time period?
- A. 8
 B. 10
 C. 51
 D. 63
 E. 70
3. For the 2 functions, $f(x)$ and $g(x)$, tables of values are shown below. What is the value of $g(f(3))$?

x	$f(x)$
-5	7
-2	-5
1	3
3	2

x	$g(x)$
-2	3
1	-1
2	-3
3	-5

- A. -5
 B. -3
 C. -1
 D. 2
 E. 7
4. For positive real numbers x , y , and z , which of the following expressions is equivalent to $x^{\frac{1}{2}}y^{\frac{2}{3}}z^{\frac{5}{6}}$?
- A. $\sqrt[3]{xy^2z^3}$
 B. $\sqrt[6]{xy^2z^5}$
 C. $\sqrt[6]{x^3y^2z^5}$
 D. $\sqrt[6]{x^3y^4z^5}$
 E. $\sqrt[11]{xy^2z^5}$

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5. If $A = \begin{bmatrix} 2 & -4 \\ 6 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 4 \\ -6 & 0 \end{bmatrix}$, then $A - B = ?$
- A. $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$
- B. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
- C. $\begin{bmatrix} 0 & -8 \\ 0 & 0 \end{bmatrix}$
- D. $\begin{bmatrix} -4 & 0 \\ -12 & 0 \end{bmatrix}$
- E. $\begin{bmatrix} 4 & -8 \\ 12 & 0 \end{bmatrix}$
6. Listed below are 5 functions, each denoted $g(x)$ and each involving a real number constant $c > 1$. If $f(x) = 2^x$, which of these 5 functions yields the greatest value for $f(g(x))$, for all $x > 1$?
- A. $g(x) = cx$
- B. $g(x) = \frac{c}{x}$
- C. $g(x) = \frac{x}{c}$
- D. $g(x) = x - c$
- E. $g(x) = \log_c x$
7. If the function f satisfies the equation $f(x + y) = f(x) + f(y)$ for every pair of real numbers x and y , what are the possible values of $f(0)$?
- A. Any real number
- B. Any positive real number
- C. 0 and 1 only
- D. 1 only
- E. 0 only
8. The imaginary number i is defined such that $i^2 = -1$. What does $i + i^2 + i^3 + \dots + i^{23}$ equal?
- A. i
- B. $-i$
- C. -1
- D. 0
- E. 1

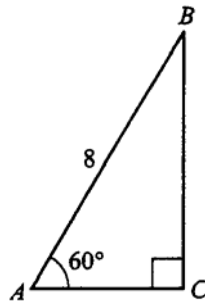
9. In an arithmetic series, the terms of the series are equally spread out. For example, in $1 + 5 + 9 + 13 + 17$, consecutive terms are 4 apart. If the first term in an arithmetic series is 3, the last term is 136, and the sum is 1,390, what are the first 3 terms?
- A. 3, 10, 17
 B. 3, 23, 43
 C. 3, $36\frac{1}{3}$, 70
 D. 3, $69\frac{1}{2}$, 136
 E. 3, 139, 1,251

Correct Answers for Sample College Algebra Items

Item Number	Correct Answer	Content Category
1	C	Arithmetic and Geometric Sequences and Series
2	E	Functions
3	B	Functions
4	D	Exponents
5	E	Matrices (basic operations, equations, and determinants)
6	A	Functions
7	E	Functions
8	C	Complex Numbers
9	A	Arithmetic and Geometric Sequences and Series

Trigonometry

1. In the right triangle shown below, the length of \overline{AB} is 8 units, $\angle A$ measures 60° , $\sin 60^\circ \approx 0.866$, $\cos 60^\circ \approx 0.5$, and $\tan 60^\circ \approx 1.73$. Approximately how many units long is \overline{BC} , to the nearest hundredth of a unit?



- A. 4.00
 B. 4.61
 C. 4.80
 D. 6.93
 E. 9.23

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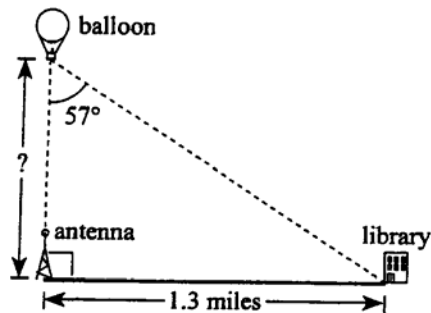
2. If $\sin \alpha = \frac{12}{13}$, and $\cos \alpha = \frac{5}{13}$, then $\tan \alpha = ?$

- A. $\frac{5}{12}$
- B. $\frac{7}{13}$
- C. $\frac{12}{5}$
- D. $\frac{17}{13}$
- E. $\frac{60}{13}$

3. If $0^\circ < x^\circ < 90^\circ$ and $\sin x = \frac{1}{2}$, then $\cos x = ?$

- A. $\frac{1}{2}$
- B. $\frac{\sqrt{3}}{2}$
- C. 2
- D. $\frac{\sqrt{3}}{3}$
- E. $\frac{2\sqrt{3}}{3}$

4. From a hot air balloon, the angle between a radio antenna straight below and the base of the library downtown is 57° , as shown below. If the distance between the radio antenna and the library is 1.3 miles, how many miles high is the balloon?

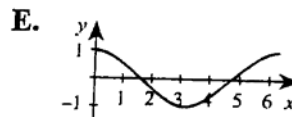
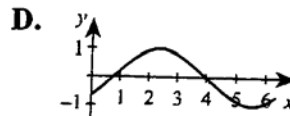
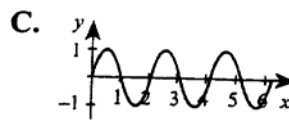
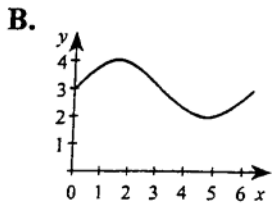
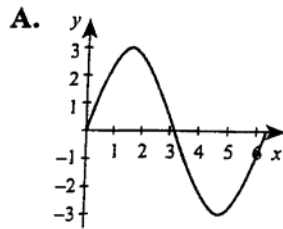


- A. $\frac{1.3}{\sin 57^\circ}$
- B. $\frac{1.3}{\cos 57^\circ}$
- C. $\frac{1.3}{\tan 57^\circ}$
- D. $1.3 \sin 57^\circ$
- E. $1.3 \tan 57^\circ$

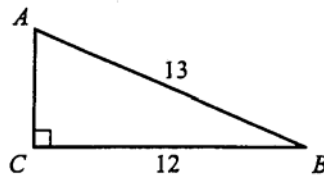
5. What is the smallest positive value for x where $y = \sin 2x$ reaches its maximum?

- A. $\frac{\pi}{4}$
- B. π
- C. $\frac{3\pi}{2}$
- D. 2π
- E. $\frac{5\pi}{2}$

6. One of the graphs below is that of $y = A \sin \theta$ for θ between 0 and 6.28 radians, where A is a constant. Which one?



7. In the right triangle below, the length of \overline{AB} is 13 units and the length of \overline{CB} is 12 units. What is the tangent of $\angle A$?



- A. $\frac{12}{5}$
- B. $\frac{13}{12}$
- C. $\frac{12}{13}$
- D. $\frac{5}{12}$
- E. $\frac{5}{13}$

Correct Answers for Sample Trigonometry Items

Item Number	Correct Answer	Content Category
1	D	Right Triangles
2	C	Functions and Identities
3	B	Special Angles
4	C	Right Triangles
5	A	Special Angles
6	A	Graphs of Functions
7	A	Right Triangle