1. Given ΔABC, with γ=90°, express c, in terms of b and α.

   A. $c = b\sec\alpha$

   B. $c = b\csc\alpha$

   C. $c = b\sin\alpha$

   D. $c = b\cos\alpha$

   E. $c = b\tan\alpha$

2. Express as a trigonometric function of one angle.

   $\sin(43°)\cos(13°) - \cos(43°)\sin(13°)$

   A. $\cos(30°)$

   B. $\sin(56°)$

   C. $\sin(30°)$

   D. $\cos(56°)$

   E. None of the above

3. An airplane, flying at a speed of 410 miles per hour, flies from Point A in the direction 240° for two hours and then flies in the direction 330° for one and a half hours. How long does it take the plane to return to Point A? Round your answer to the nearest tenth of an hour.

   A. 2.1 hours

   B. 2.5 hours

   C. 2.3 hours

   D. 2.7 hours

   E. None of the above

4. An extension ladder is extended to 21 feet. The bottom of the ladder is placed on level ground, making a 71° angle with the ground, while the top of the ladder rests against the side of a building. The ladder is then extended to 27 feet in length and the bottom of the ladder is moved 2 feet closer to the building. At this point, how far, up the side of the building, is the top of the ladder from the ground? Round your answer to the nearest tenth of a foot, assume the side of the building is perpendicular with the ground, and that the building is taller than 27 feet.

   A. 19.9 feet

   B. 25.5 feet

   C. 24.1 feet

   D. 26.6 feet

   E. None of the above

5. At 1:00 pm a ship leaves port and sails in the direction $S38°W$ at a rate of 34 mph. At 2:00 pm a second ship leaves the same port and sails in the direction of $S52°E$ at a rate of 24 mph.

   What is the bearing, rounded to the nearest degree, from the first ship to the second ship at 5:00 pm?

   A. $N30°E$

   B. $N10°E$

   C. $N48°E$

   D. $N66°E$

   E. None of the above

6. Find all solutions of the equation using n as an arbitrary integer.

$$\sin\left(2x+\frac{\pi}{4}\right)=-1$$

A. $x=\frac{5\pi}{8}+\pi n$

B. $x=\frac{\pi}{8}+\pi n$

C. $x=\frac{3\pi}{8}+\pi n$

D. $x=\frac{7\pi}{8}+\pi n$

E. None of the above

7. Find the solutions of the equation that are in the interval $[0, 2\pi)$.

$$\sin^2 t+\sin t-6=0$$

A. $t=\frac{3\pi}{2}$

B. $t=2,-3$

C. No solution

D. $t=\frac{\pi}{2}$

E. None of the above

8. If $\sin\alpha = \frac{4}{5}$ and $\cos\beta = \frac{7}{25}$ for a second-quadrant angle α and fourth-quadrant angle β, find the exact value of $\tan(\alpha + \beta)$?

A. $\frac{-3}{5}$

B. $\frac{4}{3}$

C. $\frac{-4}{3}$

D. $\frac{3}{5}$

E. None of the above

9. If $\csc\theta = \frac{-7}{4}$ for a third-quadrant angle θ, find the exact value of $\cos(2\theta)$.

A. $\frac{-8\sqrt{33}}{49}$

B. $\frac{-17}{49}$

C. $\frac{8\sqrt{33}}{49}$

D. $\frac{17}{49}$

E. None of the above

10. Find the solutions of the equation that are in the interval $[0, 2\pi)$.

$$\sin 2t = \sin t$$

A. $0, \pi, \frac{\pi}{3}, \frac{5\pi}{3}$

B. $\frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{3}, \frac{5\pi}{3}$

C. $0, \pi, \frac{\pi}{6}, \frac{11\pi}{6}$

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

E. None of the above

11. If a projectile is fired from ground level with an initial velocity of v feet per second and at an angle of θ with the horizontal, the range, R, of the projectile is given by the formula $R = \frac{v^2}{16}\sin\theta\cos\theta$.
Approximate the range of the projectile to the nearest whole foot if $v = 130$ feet per second and $\theta = 32°$.

A. 462 *feet*

B. 475 *feet*

C. 454 *feet*

D. 423 *feet*

E. None of the above

12. Find the exact value of the expression.

$$\cos^{-1}\left(\cos\frac{4\pi}{3}\right)$$

A. $\frac{4\pi}{3}$

B. $\frac{1}{2}$

C. $\frac{\pi}{3}$

D. $\frac{-1}{2}$

E. None of the above

13. Find the exact value of the expression.

$$\sin\left(2\arctan\left(\frac{-7}{5}\right)\right)$$

A. $\frac{35}{37}$

B. $\frac{35}{12}$

C. $\frac{-35}{37}$

D. $\frac{-35}{12}$

E. None of the above

14. As a hot-air balloon rises vertically, its angle of elevation from a point P on level ground, 120 meters from the point on the ground directly underneath the balloon, changes from 19° to 40°. Approximate, to the nearest tenth of a meter, how far the balloon rises during this period? Do not freak out; you can do this problem if you draw and label a diagram and use what you know.

A. 59.4 meters

B. 67.1 meters

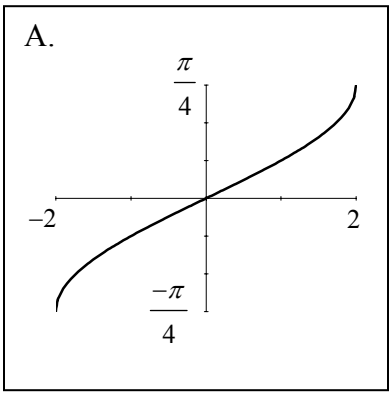
C. 41.3 meters

D. 100.7 meters

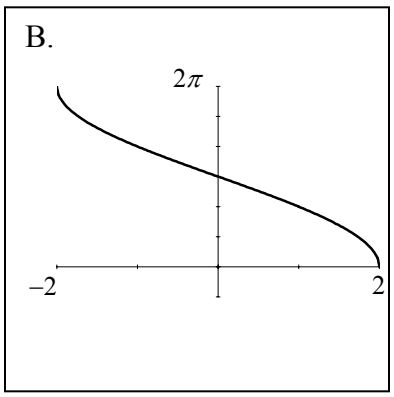
E. None of the above

15. Which of the following graphs best represents the function $y = 2\sin^{-1}\left(\frac{1}{2}x\right)$?

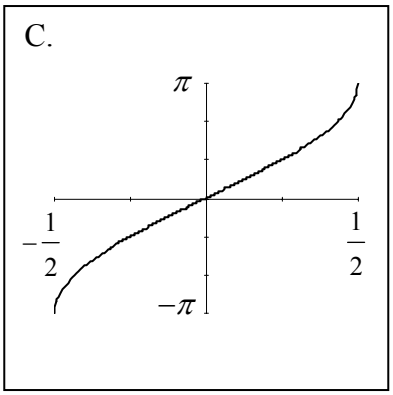
A.



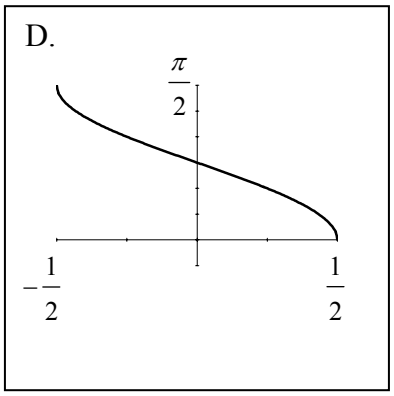
B.



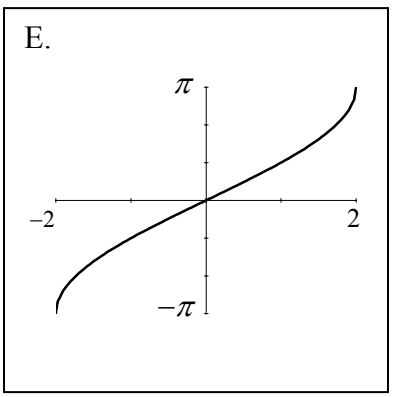
C.



D.



E.



	Answer	
1.	$c = b\sec\alpha$	A
2.	$\sin(30°)$	C
3.	2.5 hours	B
4.	26.6 feet	D
5.	$N66°E$	D
6.	$x = \frac{5\pi}{8} + \pi n$	A
7.	No solution	C
8.	$\frac{4}{3}$	B
9.	$\frac{17}{49}$	D
10.	$0, \pi, \frac{\pi}{3}, \frac{5\pi}{3}$	A
11.	475 *feet*	B
12.	$\frac{2\pi}{3}$	E
13.	$\frac{-35}{37}$	C
14.	59.4 meters	A
15.	Domain: [-2, 2] Range: [-π, π]	E