Teacher/School_____Class Time_____Name_____

Instructions. Answers with no work may be counted incorrect. The grader must be able to understand your thought process from your work, so be clear. You may use your calculator on this exam. Write your answer on the box provided. **When an exact answer is not required, round to 3 decimal places, unless otherwise indicated.**

1. (4 pts.) The largest escalator in the U.S. is 200 feet long (the distance people actually travel), and has an angle of elevation of 25.15 degrees. How high is the top of this escalator above the ground floor? Round to the nearest foot.

WORK:

Answer

2. (4 pts.) A Tornado jet and a F-16 Fighting Falcon jet are flying side by side in close formation. They break out of formation, and the angle between their paths is 36 degrees. If the Tornado flies at 1450 miles/hr, and the Falcon flies at 1350 miles per hour, how far apart are they after 2 hours? Round to the nearest tenth of a mile.

WORK:

Answer

3. (4 pts.) One Coast Guard station is located 105 miles due west of a second station. A ship sends a distress signal that is picked up by both stations. The location of the ship from the east station is 35 degrees west of south. The location from the ship from the west station is 42 degrees east of south. How far is each station from the ship. Round to the nearest tenth of a mile.

WORK:

Answer

4. (4 pts.) Jill and Johnny are running around the high school track. When they go around the curve (which is a semi-circle), Jill runs in the inside lane, which has a radius of 36.50 meters, and Johnny runs in the outside lane, which has a radius of 46.26 meters. In completely rounding the curve, how much farther must Johnny run? Round to the nearest tenth of a meter.

WORK:

Answer

5. If $\sec\theta = \frac{13}{12}$ and θ is between $\frac{3\pi}{2}$ and 2π, find exact values in reduced form for

a. (2 pts.) $\tan\theta$

WORK:

Answer

b. (2 pts.) $\sin 2\theta$

WORK:

Answer

c. (2 pts.) $\cos\frac{\theta}{2}$

WORK:

Answer

6. (4 pts.) Algebraically solve for the **exact** values of all angles in the interval $[0,2\pi)$ that satisfy the equation $\cos\theta + \sin\theta = 1$

   WORK:

   Answer [   ]

7. (4 pts.) A weight is attached to the end of a frictionless spring, pulled down to extend the spring, and then released. Let d be the distance of the weight above the floor at time t, where d is in centimeters and t is in seconds. The distance varies sinusoidally over time. A stopwatch reads 0.5 seconds when the weight reaches its first high point 42 centimeters above the floor, and the next low point, 11 centimeters above the floor, occurs at 1.2 seconds. Write a trigonometric equation to express d in terms of t.

   WORK

   Answer [   ]

   b. (2 pts.) Algebraically determine the distance from the floor at 4 seconds.

   a. *WORK:*

   Answer [   ]

8. Consider $y = -2\cos(\frac{\pi}{4}(\theta - 2)) + 3$

a. (2 pts.) What is the period of this function?

Answer [   ]

b. (2 pts.) What is the vertical shift of this function?

Answer [   ]

c. (2 pts.) What is the horizontal shift of this function?

Answer [   ]

d. (4 pts.) Sketch the graph of the function in the space below. Label your x-axis in at least 3 points to show you have your period marked correctly. Label your y-axis at the midline of the curve and at 2 other places.

9. (4 pts.) Change $(5, \frac{5\pi}{6})$ from polar to rectangular coordinates. List exact values.

WORK:

Answer [   ]

10. (2 pts.) Change $r = \frac{3}{1-2\cos\theta}$ to a rectangular equation. Put your answer in the form $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$.

WORK:

Answer

11. (4 pts.) If vector $v = 3i + 2j$ and vector $w = -2i - 2j$, find the **magnitude** of vector $(-3v - 3w)$. Round to two decimal places.

WORK:

Answer

12. (4 pts.) Vector A has a length of 3.75 cm and an angle of 34 degrees from the positive x-axis. Vector B has a length of 4.12 cm and an angle of 75 degrees from the positive x-axis. Vector C has a length of 5.34 cm and an angle of 120 degrees from the positive x-axis. Rounding to two decimal places, find the magnitude and the direction (in degrees) of the resultant vector when the 3 vectors are added together .

WORK:

Answer

13. (4 pts.) Verify that the following equation is an identity. $\csc\theta\tan\theta = \cos\theta\sec^2\theta$