

Math 154 Pre Calculus II Cornerstone Final 2018-2019

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.) In Sichuan, China Bernarda stands at the top of the Jinping-1 dam and measures the angle of depression down to where Benjimin is standing at 2000 feet from the base of the dam. If the angle of depression is 26.6 degrees, how tall is the dam? Round to the nearest tenth of a foot.

WORK:

Answer

2. (4 pts.) When designing a kitchen, the stove, sink, and refrigerator form the "work triangle." By design, the three parts of the work triangle must be no less than 3 feet apart and no more than 7 feet apart. In a current kitchen, the sink is 3.6 feet away from the stove and 5.7 feet away from the refrigerator. If the sink forms a 120 degree angle with the stove and the refrigerator, explain mathematically whether the distance between the stove and the refrigerator will satisfy the requirements of the work triangle.

WORK:

Answer

3. (4 pts.) In a certain city, the maximum height of a radio tower on top of an office building is 30 feet. Jamie stands away from a 45 foot tall building on level ground and measures the angle of elevation to the top of the building to be 25 degrees. What is the maximum angle of elevation to the top of a legal radio tower on this building?

WORK:

Answer

4. (4 pts.) 2 concentric circles have radii of 1m and 3m, respectively. A mouse travels around 17 degrees of the smaller circle while another mouse travels around 9 degrees of the larger circle in the same amount of time. What is their ratio of distances traveled?

WORK:

Answer

5. If $\csc\theta = -\frac{5}{4}$, and θ is between π and $\frac{3\pi}{2}$, find exact values in reduced form for
- a. (2 pts.) $\cot \theta$

WORK:

Answer

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

WORK:

Answer

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

WORK:

Answer

6. (4 pts.) Algebraically solve for the **exact** values of all angles in the interval $[0, 2\pi)$ that satisfy the equation $\cos^3 x = \cos x$

WORK:

Answer

7. (4 pts.) As the paddle on a paddleboat turns, the height, h , of a single paddle from the water's surface can be modeled with a sinusoidal function. When a stopwatch reads 5 sec, one of the paddle blades was at its highest, 18 feet above the water's surface. Assume the wheel's diameter is 20 feet, and it completed a revolution every 9 seconds. Write a trigonometric equation to express h in terms of t .

WORK

Answer

b. (2 pts.) Determine when the paddle (on its way *up*) would be 7 feet above the surface of the water during the second revolution of the wheel.

a. **WORK:**

Answer

8. Consider $y = -\frac{1}{2}\sin(\pi(x + 1)) + 2$

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 $(-3, 6)$ from rectangular to polar coordinates.~~

~~**WORK.**~~

Answer

~~10. (2 pts.) Change $6 \sec \theta$ to a rectangular equation.~~

~~WORK.~~

Answer

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

WORK:

Answer

12. (4 pts.) Verify that the following equation is an identity. $\csc \theta = \frac{\cot \theta + 1}{\cos \theta + \sin \theta}$

13. (4 pts.) A dodge ball player is trying to avoid getting hit by the opposing team. The player runs 2.7 m at an angle 37° . Then he runs 4.9 m at an angle of 62° . Then he runs 1.7 m at an angle of 13° . Rounding to two decimal places, find the magnitude and the direction (in degrees) of the resultant displacement when the 3 vectors are added together.

WORK:

Answer