Week 8 Problems

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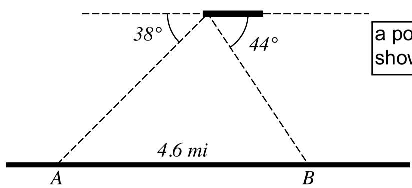
#1 Points possible: 1. Total attempts: 2

A pilot is flying over a straight highway. He determines the angles of depression to two mileposts, 4.6 mi apart, to be 38° and 44°, as shown in the figure.



a possibly more clear figure is shown on p. 465, problem 35

NOTE: The picture is NOT drawn to scale.

Find the distance of the plane from point A.
distance from A = ________ mi 3.227 miles
Find the elevation of the plane.
height = ________ mi 1.987 miles

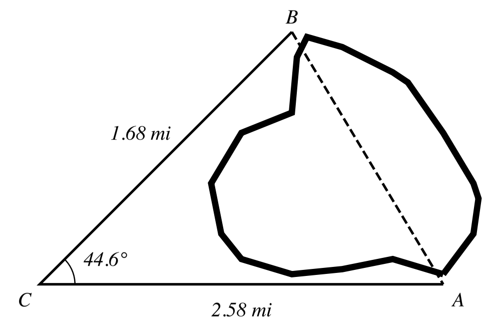
Enter your answer as a number; your answer should be accurate to 2 decimal places.

#2 Points possible: 1. Total attempts: 2

A pilot flies in a straight path for 1 h 30 min. She then makes a course correction, heading 10 degrees to the right of her original course, and flies 2 h in the new direction. If she maintains a constant speed of 685 mi/h, how far is she from her starting position?
Your answer is ______________ mi;
Enter your answer rounded to two decimal places.
2388.56~~33249807~~

#3 Points possible: 1. Total attempts: 2

To find the distance across a small lake, a surveyor has taken the measurements shown. Find the distance across the lake using this information.



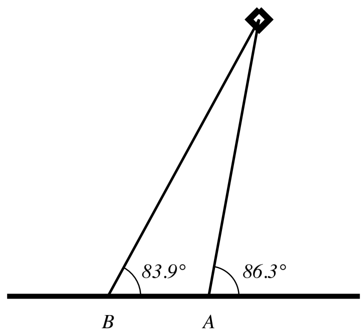
NOTE: The triangle is NOT drawn to scale.

distance = ________________ 1.818 miles

Enter your answer as a number; your answer should be accurate to 2 decimal places.

#4 Points possible: 1. Total attempts: 2

The path of a satellite orbiting the earth causes it to pass directly over two tracking stations *A* and *B*, which are 74 km apart. When the satellite is on one side of the two stations, the angles of elevation at *A* and *B* are measured to be 86.3° and 83.9°, respectively.



NOTE: The picture is NOT drawn to scale.

How far is the satellite from station A?
distance from *A* = ________ km 1757.13 km
How high is the satellite above the ground?
height = ________ km 1753.47 km

Enter your answer as a number; your answer should be accurate to 2 decimal places.

#5 Points possible: 1. Total attempts: 2

To estimate the height of a building, two students find the angle of elevation from a point (at ground level) down the street from the building to the top of the building is 32°. From a point that is 400 feet closer to the building, the angle of elevation (at ground level) to the top of the building is 57°. If we assume that the street is level, use this information to estimate the height of the building.

The height of the building is ________________ feet.
420.6~~4220175357~~

#6 Points possible: 1. Total attempts: 2

The four sequential sides of a quadrilateral have lengths $a = 5.5$, $b = 6.7$, $c = 8.4$, and $d = 10.7$ (all measured in yards). The angle between the two smallest sides is $\alpha = 100^\circ$.

What is the area of this figure?
area = ________________ yd²
55.96~~2813431003~~

#7 Points possible: 1. Total attempts: 2

Convert the polar coordinate $\left(5, \frac{2\pi}{3}\right)$ to Cartesian coordinates.
Enter exact values.

x = ________________ 5*(-1/2) = -5/2 = -2.5

y = ________________ 5*(sqrt(3)/2)

#8 Points possible: 1. Total attempts: 2

Convert the Cartesian coordinate (6,-6) to polar coordinates, $0 \leq \theta < 2\pi$

r = ________________ sqrt(72) = 6*sqrt(2)
Enter exact value.

θ = ________________ 7pi/4

#9 Points possible: 1. Total attempts: 2

Rewrite the polar equation $r = 5\sin(\theta)$ as a Cartesian **equation**.

$x^2 + y^2 = 5 \cdot y$

#10 Points possible: 1. Total attempts: 2

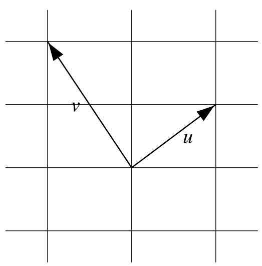
Rewrite the Cartesian equation $y = 4x^2$ as a polar equation.

$r(\theta)$ = ________________

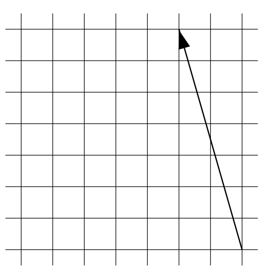
Enter **theta** for θ if needed.

$\frac{\sin(\theta)}{4 \cdot (\cos(\theta))^2}$

#11 Points possible: 1. Total attempts: 2



Write the vector shown below as a combination of vectors $\vec{u}$ and $\vec{v}$ shown above



Vector = ___ $\vec{u}$ + ___ $\vec{v}$

Note: In both graphs, each box is 1 unit by 1 unit in size

1
3

#12 Points possible: 1. Total attempts: 2

Three different forces act on an object. They are:

$\vec{F}_1 = <-6,-6>$
$\vec{F}_2 = <-4,2>$
$\vec{F}_3 = <-3,-4>$

Find the net force F_{net} on the object (the sum of the forces)

$F_{net} =$ ________________

Find what fourth force, F_4 would need to be added so the object feels no force, that is, so $F_{net} = 0$

F_4 = ________________
$<-13,-8>$
$<13,8>$

#13 Points possible: 1. Total attempts: 2

An airplane is heading north at an airspeed of 500 km/hr, but there is a wind blowing from the northeast at 60 km/hr.

The plane will end up flying ________________ degrees off course 5.3 degrees

The plane's speed relative to the ground will be ________________ km/hr 459.5 km/hr

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#14 Points possible: 1. Total attempts: 2

An airplane needs to head due north, but there is a wind blowing from the northwest at 60 km/hr. The plane flies at an airspeed of 600 km/hr,

To end up due north, the pilot will need to fly the plane ________________ degrees west of north

4.05~~48072279971~~

#15 Points possible: 1. Total attempts: 2

Two children are throwing a ball back-and-forth straight across the back seat of a car. The ball is being thrown 8 mph relative to the car, and the car is travelling 25 mph down the road.

If one child doesn't catch the ball and it flies out the window, in what direction does the ball fly (ignoring wind resistance)?

________________ degrees, measured relative to the car's forward direction

17.7~~44671625057~~

#16 Points possible: 1. Total attempts: 2

Eliminate the parameter t to find a simplified Cartesian equation of the form $y = mx+b$ for

$$\begin{cases} x(t) = 1-t \\ y(t) = -7-2t \end{cases}$$

The Cartesian equation is y = ________________

$2x-9$

#17 Points possible: 1. Total attempts: 2

Given the parametric equations below, eliminate the parameter *t* to obtain an equation for *y* as a function of *x*

$$\begin{cases} x(t) = 7\sqrt{t} \\ y(t) = 6t+4 \end{cases}$$

$y(x)$ = ________________

$6\left(\frac{x}{7}\right)^2+4$

#18 Points possible: 1. Total attempts: 2

Eliminate the parameter *t* to find a Cartesian equation in the form $x = f(y)$ for:

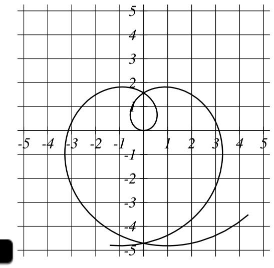
$$\begin{cases} x(t) = 2t^2 \\ y(t) = 3+5t \end{cases}$$

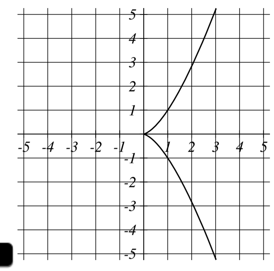
The resulting equation can be written as x = ________________________

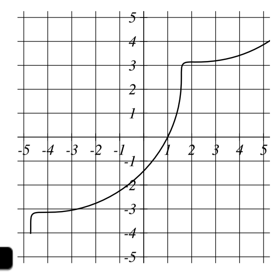
$\frac{2}{25}y^2-\frac{12}{25}y+\frac{18}{25}$

#19 Points Possible: 1. Total attempts: 2

Match equation graph with its parametric equation. Not all equations will be used. All graphs shown for $-5 \le t \le 5$

[redacted] 

[redacted] 

[redacted] 

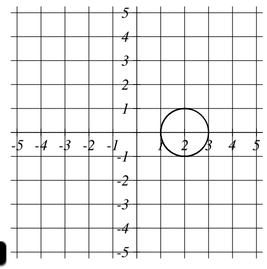
a. $\begin{cases} x(t) = 2+\cos(t) \\ y(t) = \sin(t) \end{cases}$

b. $\begin{cases} x(t) = t^2 \\ y(t) = t^3 \end{cases}$

c. $\begin{cases} x(t) = t^3-t \\ y(t) = t^2 \end{cases}$

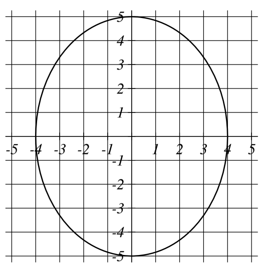
d. $\begin{cases} x(t) = t\cos(t) \\ y(t) = t\sin(t) \end{cases}$

e. $\begin{cases} x(t) = t+\cos(t) \\ y(t) = t+\sin(t) \end{cases}$



d b e a

#20 Points possible: 1. Total attempts: 2



The graph below can be represented by parametric equations of the form

$$\begin{cases} x(t) = a\cos(t) \\ y(t) = b\sin(t) \end{cases}$$

Where a = ____ and b = ____
4
5

#21 Points possible: 1. Total attempts: 2

The ellipse $\frac{x^2}{6^2}+\frac{y^2}{5^2}=1$ can be drawn with parametric equations where $x(t)$ is written in the form

$x(t) = r\cos(t)$ with r = ______

and y(t) = __________________
6
$5 \cdot \sin(t)$

#22 Points possible: 1. Total attempts: 2

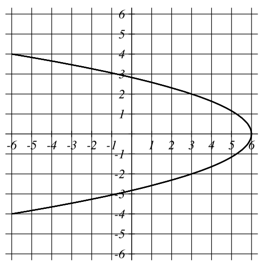
Suppose parametric equations for the line segment between $(4,5)$ and $(2,-7)$ have the form:

$$\begin{cases} x(t) = a+bt \\ y(t) = c+dt \end{cases}$$

If the parametric curve starts at $(4,5)$ when $t=0$ and ends at $(2,-7)$ at $t=1$, then find a, b, c, and d.

$a =$ __________________
$b =$ __________________
$c =$ __________________
$d =$ __________________
4
-2
5
-12

#23 Points possible: 1. Total attempts: 2



The plot above is created with the parametric equations

$$\begin{cases} x(t) = a\ \cos(bt) \\ y(t) = c\ \sin(dt) \end{cases}$$

To acheive this graph,
a = ________________
b = ________________
c = ________________
d = ________________

Hint: b and d are both whole numbers from 1 to 3
6
2
4
1

#24 Points possible: 1. Total attempts: 2

A bicycle wheel has radius R. Let P be a point on the spoke of a wheel at a distance d from the center of the wheel. The wheel begins to roll to the right along the the x-axis. The curve traced out by P is given by the following parametric equations:

$$\begin{cases} x(\theta) = 17\theta - 14\sin(\theta) \\ y(\theta) = 17 - 14\cos(\theta) \end{cases}$$

What must we have for R and d?
R = ________________
d = ________________
17
14
