East Los Angeles College
Department of Mathematics
Math 241
Final Exam Study Guide

An airplane flies at a speed of 300 mph in a heading N30W. The wind is traveling at a speed of 20 mph in a heading due South.

1. Determine the velocity vector of the airplane.
2. Determine the velocity vector of the wind.
3. Determine the resultant vector.
4. Determine the airplanes true speed with the wind.
5. Determine the airplanes true heading.

Forces on an object.

Let $\overline{F_1} = -8i + 3j$ and $\overline{F_2} = 4i - 2j$ and $\overline{F_3} = i + j$

6. Determine the resultant force vector.
7. Determine the magnitude of the resultant force vector.
8. Determine the standard angle (direction) of the resultant force vector.

Let $r = 3 + 3sin(\theta)$

9. Determine the Cartesian coordinate equation.
10. Graph $y = 3 + 3sin(\theta)$ over $0 \leq \theta \leq 2\pi$
11. Graph the polar equation $r = 3 + 3sin(\theta)$.

Let $r^2 = cos(2\theta)$

12. Determine the Cartesian coordinate equation.
13. Graph $y = cos(2\theta)$ over $0 \leq \theta \leq 2\pi$
14. Graph the polar equation $r^2 = cos(2\theta)$

Let $r = -2\cos(\theta)$

12. Determine the cartesian coordinate equation.
13. What is the center and radius of the circle.
14. Graph the polar equation $r = -2\cos(\theta)$

Let $r = 6sin(\theta)$

15. Determine the cartesian coordinate equation.
16. What is the center and radius of the circle.
17. Graph the polar equation $r = 6sin(\theta)$

Solve the following trigonometric equations for θ over $0 \leq \theta \leq 2\pi$

18. $cot(2\theta) = -1$
19. $\sqrt{2}cos\left(\frac{\theta}{2}\right) - 1 = 0$
20. $(2sin(\theta) + 1)(tan(\theta) - 1) = 0$
21. $2sin^2(3\theta) = 1$

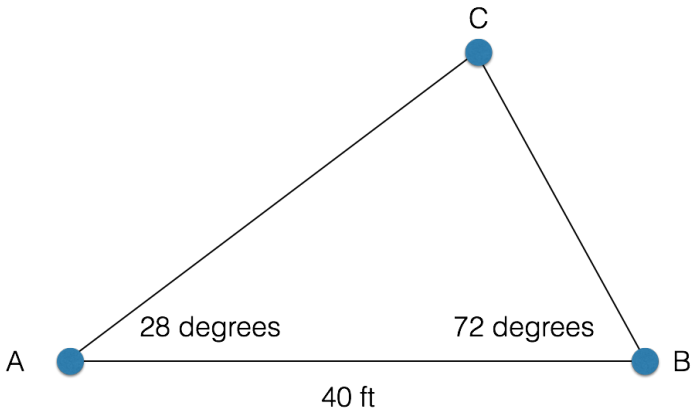
Give the sequence formula solution for the above trigonometric equations.

22. Problem 18
23. Problem 19
24. Problem 20
25. Problem 21

Navigation

26. Two boats leave the same port at the same time. One travels at a speed of 45 mph in the direction N60E and the other travels at the speed of 65 mph in a direction S20E. After 2 hours, how far apart are the boats?

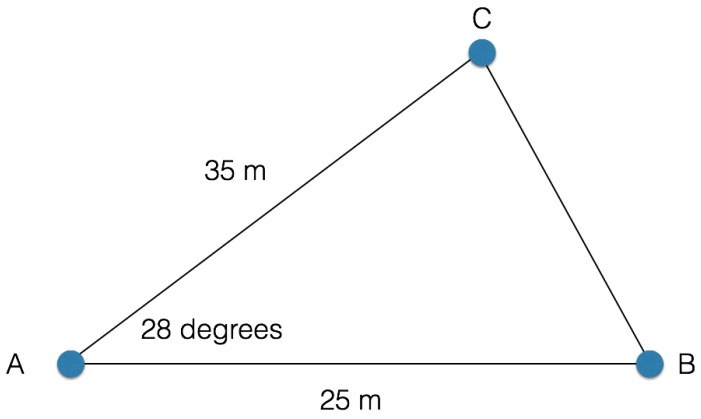
Triangle



Determine the following values.

27. Angle C
28. $\overline{AC}$
29. $\overline{BC}$
30. Determine the area of the triangle.

Triangle



Determine the following values.

31. Angle B
32. Angle C
33. $\overline{BC}$
34. Determine the area of the shaded region.

Speed of a Car

35. The wheels of a car have a radius of 12 inches and are rotating at 500 rpm. Determine the speed of a car in mph.

Truck wheels

A truck with 46-inch diameter wheels is traveling at 60 mph.

36. Determine the angular speed of the wheels in radians per minute.
37. How many rpm's do the wheels make?

$$y = tan\left(2\left(x + \frac{\pi}{4}\right)\right)$$

38. Determine the period.
39. Determine the phase shift.
40. Determine the interval of one cycle.
41. Graph the curve.

$$y = cot\left(\frac{1}{4}\left(x - \frac{\pi}{3}\right)\right)$$

42. Determine the period.
43. Determine the phase shift.
44. Determine the interval of one cycle.
45. Graph the curve.