Pre-Calculus Homework #12

1) Convert 596 degrees to radians, convert 316.57 decimal degrees into degrees, minutes, and seconds, convert $\frac{-17\pi}{5}$ radians into degrees, and convert $157^\circ 38' 42''$ into decimal degrees.
2) If the directrix of a conic section is the line $x = -7$ and the focus is at the point $(1, -5)$, what type of conic is it and find the equation of the conic in standard form.
3) Find the values of the following trigonometric functions. If an answer can be found exactly, you must produce the exact answer, showing all work, without the aid of a calculator, otherwise, round each approximate answer to 4 decimal places:

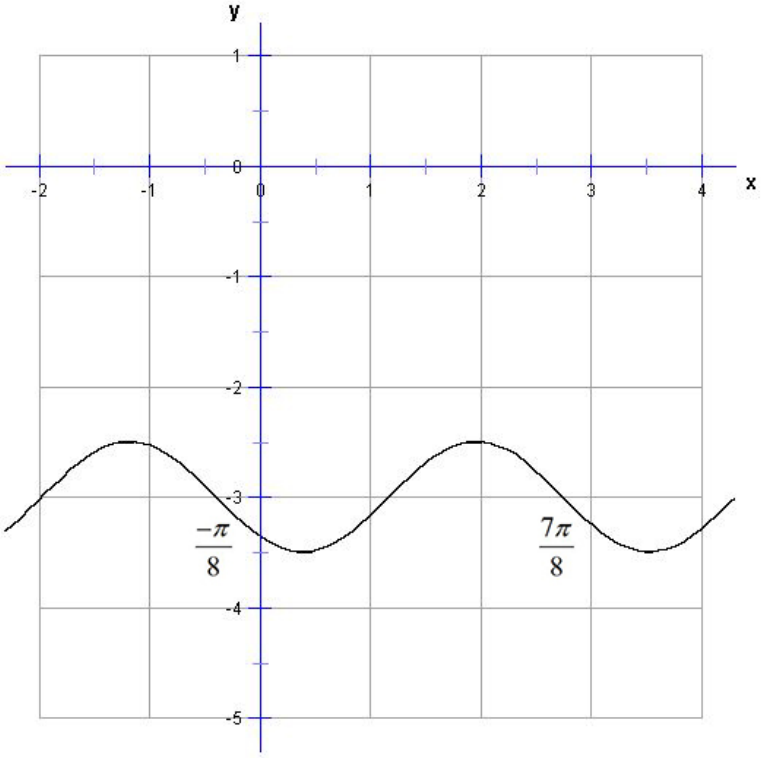
$$\cot 675^\circ, \quad \sin 214.93^\circ, \quad \sec \frac{5\pi}{3}, \quad \csc 119^\circ 15' 54''$$

4) If the endpoints of a diameter of a circle are the points (–9,–8) and (7, 10), find the equation of the circle in standard form.
5) Find all the values of θ for each of the following trigonometric equations. If an answer can be found exactly, you must produce the exact answer, showing all work, without the aid of a calculator, otherwise, round each approximate answer to 4 decimal places:

$$\cos\theta = \frac{-\sqrt{3}}{2}, \quad \tan\theta = \frac{-\sqrt{3}}{3}, \quad \sin\theta = \sqrt{2}, \quad \csc\theta = 6$$

6) The rear tires on a John Deere 3255 farm tractor have a diameter of 72 inches. If, while farming, the angular velocity of a rear tire of this tractor is 8630 degrees per minute, what is the linear velocity of the tractor (rounded to one decimal place) in miles per hour?
7) A fishing boat is located due east of a lighthouse and a tug boat is exactly 14 miles due north of the fishing boat. If the bearing from the tug boat to the lighthouse is exactly $S 38^\circ 24' 46.8'' W$, how far away (in miles rounded to one decimal place) is the tug boat from the lighthouse?
8) If $y = -3\cos(2x + \pi) + 4$, determine if the graph is inverted, find the amplitude, period, phase shift, vertical shift and graph the function based on these answers and your knowledge of the cosine function.
9) Two pulleys, of different sizes, are connected by a belt. If the diameter of the larger pulley is 30 inches and it is turning with an angular velocity of 800 degrees per second, how fast is the smaller pulley, which has a diameter of 8 inches, rotating in revolutions per minute?
10) Emily is in a hot-air balloon that is floating at an altitude of 8448 feet. She looks off into the distances and sees that the balloon is headed straight towards two towns. If, when she looks directly at the town furthest away, her angle of depression is 16 degrees and, when she looks directly at the town closest to her, her angle of depression is 37 degrees, how far away (in miles rounded to one decimal place) are the towns from one another?

11) Use the following graph to determine the type of trigonometric function involved, whether the graph is inverted, the amplitude, period, phase shift, vertical shift of this function and then use this information to write the equation of this function in standard form.



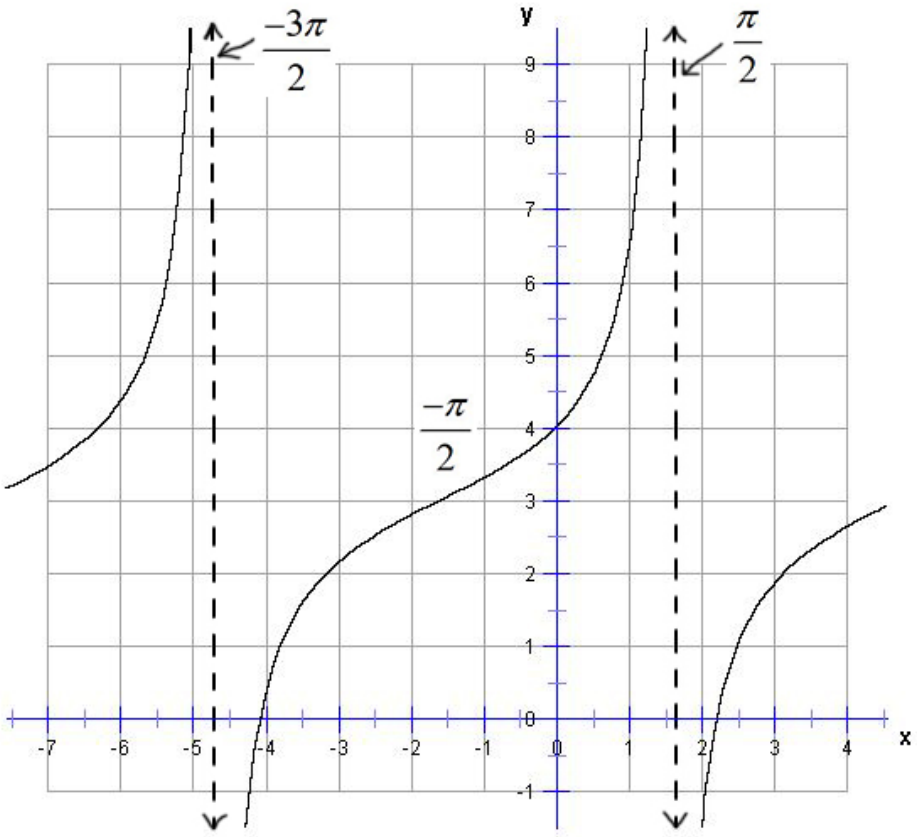
12) If the earth has a diameter of 7926 miles and you were standing on the surface of the earth at some point on the equator, what is your linear velocity (rounded to one decimal place) in miles per hour?

13) Nina and Angela take a trip to Wyoming to see Devil's Tower. Standing at the visitor's center near the base of the tower, Nina looks up at the top of the tower using an angle of elevation of 63 degrees. If Angela walks exactly 210 feet closer to the base of the tower and sees the top using an angle of elevation of 75 degrees, how tall (in feet rounded to one decimal place) is Devil's Tower?

14) If $y = 4\sec(3x - \pi) - 2$, determine if the graph is inverted, find the amplitude, period, phase shift, vertical shift and graph the function based on these answers and your knowledge of the secant function.

15) Joshua buys a house on a river in the hopes of creating his own green energy from the power of the moving water. In order for Joshua's generator to operate properly and provide him with the electricity he needs, the rotor attached to the turbine must spin with an angular velocity of 1340 degrees per second. If the river has a linear velocity of 15 miles per hour, how large (in feet rounded to one decimal place) must the diameter of a waterwheel be in order for Joshua's generator to operate properly?

16) Use the following graph to determine the type of trigonometric function involved, determine if the graph is inverted, period, phase shift, vertical shift of this function and then use this information to write the equation of this function in standard form.



17) On a trip to St. Louis, Rebecca and Erica decide to try to measure the width of the Mississippi River at the Gateway Arch. It is impossible for them to directly measure the width of such a wide river so they decide to use two surveyor's transits and their knowledge of mathematics to estimate the width. Rebecca and Erica stand on the bank of the river, next to the arch and find a tree on the other bank of the river that is directly opposite from their location. Erica then takes the transit and walks 300 feet down the river bank. Rebecca uses her transit to make sure that Erica stays on a path that is exactly perpendicular to path from Rebecca to the tree. Erica then uses her transit to find that same tree and measures the angle from where Rebecca is standing to where the tree is located and finds that it is exactly $78^\circ 59' 15.8''$. Based on these measurements, how wide is the river at Rebecca's location and how far is Erica away from that tree? (give your answers in feet rounded to one decimal place)

18) If $y = -2\tan(\frac{1}{3}x + \frac{\pi}{4}) - 5$, determine if the graph is inverted, find the period, phase shift, vertical shift and graph the function based on these answers and your knowledge of the tangent function.

19) Impressed with her ability to calculate the width of a river without actually being able to measure it, Rebecca decides to tackle a far more challenging problem. She wants to try to determine the radius of the earth without being able to actually measure it. To accomplish this, Rebecca packs up her trusty transit and heads to Mount Washington in New Hampshire. She climbs to the summit which is at an elevation above sea level of 6288 feet. She sets up her transit and looks out to the southeast where, on a clear day, you can actually see the Atlantic Ocean. She sets her transit to point directly at the horizon on the ocean and measures the angle of depression to be $1^{\circ}24'37.4"$, what is the radius of the earth in miles rounded to one decimal place?

20) Use the following graph to determine the type of trigonometric function involved, determine if the graph is inverted, find the amplitude, period, phase shift, vertical shift of this function and then use this information to write the equation of this function in standard form.