Math 36 Midterm 3 Review

1. Solve the triangles if given the following information.
   a)  $A = 100^\circ, b = 12, a = 15$
   b)  $B = 20^\circ, c = 40, b = 30$
   c)  $A = 50^\circ, b = 7, c = 10$
   d)  Given $B = 37^\circ, a = 5, b = 4$ (This is the ambiguous case!)

2. Find the area of the triangle if given the following information.
   a)  $a = 10, b = 12, C = 120^\circ$
   b)  $A = 46^\circ, B = 95^\circ, c = 7$
   c)  $a = 7, b = 3, c = 8$

3. Write each complex number in trigonometric form.
   a)  $2 + 3i$
   b)  $3$
   c)  $2i$

4. Write each complex number in standard form.
   a)  $10(\cos 30^\circ + i \sin 30^\circ)$
   b)  $3 \text{cis} 210^\circ$

5. Find the product and quotient of $z_1 = 1 + i\sqrt{3}$ and $z_2 = -\sqrt{3} + i$ in standard and trigonometric form.

6. Use Demoivre's theorem to expand the following binomial.
   a)  $(3 + i)^{10}$
   b)  $(2 - i)^4$
   c)  $(3 + i\sqrt{2})^6$

7. Use De Moivre's Theorem to show that $1 + i$ is or is not a solution to $x^{10} - 32i = 0$.

8. Solve using the $n^{th}$ root theorem. Answers are to be in standard and Polar/Trigonometric form. Answers in standard form are to be rounded off to one decimal place.
   a)  $x^3 - 27 = 0$
   b)  $x^4 + \sqrt{3} - i = 0$.

9. Write each equation in rectangular form.
   a)  $r^2 = 3 \sin 2\theta$
   b)  $r(\cos \theta - \sin \theta) = 2$

10. Write each equation in polar form.
    a)  $x - y = 9$
    b)  $x^2 + y^2 = 4x$

11. Graph $r = 4 + 2\sin \theta$ by first graphing $y = 2\sin x + 4$ and then using that relationship to graph $r = 4 + 2\sin \theta$. (I would study more of these different types of graphs!)
Now try these problems on your own. That is no Notes, Book or Friend. You can use a scientific calculator for this exam. If you can do them on your own without any issues, then you will do fine for the exam!

12. Solve triangle \(ABC\) with \(B = 32^\circ\), \(b = 100\ ft\), and \(c = 150\ ft\). (Hint: Determine the number of possible triangles first, before trying to solve)

13. A ship sailing due west at 20 miles per hour records the bearing of an oil rig at \(56^0\) north of west. Two hours later the bearing of the same rig is \(37^0\) north of east.
   a) How far is the ship from the oil rig the second time?
   b) How close did the ship pass the oil rig?

14. Two hikers, Sonia and Tony, leave the same point at the same time. Sonia walks due east at the rate of 3 miles per hour, and Tony walks \(45^0\) north of east at the rate of 4 miles per hour. How far apart are the hikers after three hours?

15. Three cell towers are located in Riverside. Suppose the lines of sight from tower A to tower B and C from an angle of \(120^0\) and the distances between tower A and towers B and C are 3.6 miles and 4.2 miles, respectively. Find the area of the triangle having these three towers as vertices.

16. Convert each polar equation to a rectangular equation and sketch their graphs.
   a) \(r = 3\)
   b) \(\theta = \frac{5\pi}{6}\)
   c) \(r = \csc \theta\)
   d) \(r = 2 \cos \theta\)

17. Graph \(r = \sin 2\theta\) by using the graph of \(y = \sin 2x\) as a guide.

18. Graph \(r = 1 - 2 \cos \theta\) by using the graph of \(y = -2 \cos x + 1\) as a guide.

19. Let \(z = -1 + i\). Use De Moivre’s Theorem to find \(z^{-12}\). Write your answer in rectangular form.

20. Find the three cube roots of \(-1 + i\). Write your answer in polar form with the argument in radians.