Name

NO GRAPHING CALCULATORS!!!

- 1. (5 pts) Find all solutions  $x \in [0, 2\pi)$  of the equation  $2\cos(x) 1 = 0$ . This will support #2 and **Bonus 1**.
- 2. (5 pts) Find all solutions  $x \in [0, 2\pi)$  of the equation  $2\cos(2x) 1 = 0$ . This supports #3 and **Bonus 2**.
- 3. (5 pts) Find *all* solutions of the equation in #2.
- 4. (10 pts) Sketch the graph of  $f(x) = 2\cos(2x) 1$  in *rectangular coordinates*. This graph will support

## Bonus 2, but it will have more of a "Bonus 3 shape."

- 5. Consider the triangle in the figure.
  - a. (10 pts) Use the Law of Cosines to find the length of side *c*. Round your final answer to 4 decimal places, but keep the un-rounded number in your calculator for the next question.



- b. (5 pts) Give an *exact* answr to part a, in simplified radical form.
- c. (10 pts) Use the Law of Sines to find the measure of angle A, in degrees, to 4 decimal places.
- 6. Let  $f(x) = 2x^3 9x^2 + 8x + 39$ .
  - a. (10 pts) Use synthetic division to show that x = 3 + 2i is a solution of the equation f(x) = 0.
  - b. (5 pts) Find the linear factorization of f that is promised by the Fundamental Theorem of Algebra
- 7. (5 pts) Express z = 5-5i in trigonometric form.

8. Let 
$$z = 81\left(\cos\left(\frac{11\pi}{6}\right) + i\sin\left(\frac{11\pi}{6}\right)\right)$$
.

- a. (10 pts) Express z in standard form.
- b. (10 pts) Find the principal 4<sup>th</sup> root of z, i.e., find  $\sqrt[4]{z}$ . Leave z in trigonometric form for this.
- c. (10 pts) Now, find the *other* three  $4^{th}$  roots of z, in trigonometric form.

Bonus Section Answer up to two (2) Bonus questions for up to 20 points.

- **Bonus 1.** (10 pts) Sketch the graph of  $r = 2\sin(x) 1$  in *polar coordinates*.
- **Bonus 2.** (10 pts) Sketch the graph of  $r = 2\sin(2x) 1$  in *polar coordinates*.
- **Bonus 3.** (10 pts) Sketch the graph of  $f(\theta) = 20\cos\left(\frac{\pi}{30}\theta + \frac{\pi}{3}\right) + 40$ . Show the midline as a dashed line,

and clearly label the standard 5 (evenly-spaced) points that I always want to see. After this class, you won't be asked for this, special. It'll just be expected that you will find those key points.

**Bonus 5.** (10 pts) Find 
$$\sin\left(\frac{u}{2}\right)$$
,  $\cos\left(\frac{u}{2}\right)$  and  $\tan\left(\frac{u}{2}\right)$ , given that

$$\cos(u) = \frac{5}{16}$$
 and  $\tan(u) < 0$ .

**Bonus 6.** (10 pts) Build a *sine* function that achieves its maximum height of y = 215 meters at time x = 8 seconds and its minimum height of y = 15 meters at x = 40 seconds.