Math 1151, Exam 2 (in-class)
March 12, 2010

Name: _____

Discussion Section: _____

Discussion TA: _____

This exam has six multiple-choice problems, each worth six points. When you have decided on a correct answer to a given question, circle the answer in this booklet. There is no partial credit for the multiple-choice problems. This exam has six open-ended problems, whose point-values are given in the problem. Make sure to show all your work and circle your final answer. This exam is closed book and closed notes. You may use a scientific calculator but not a graphing calculator.

Sum and Difference Formulas

$$\begin{aligned}
\cos(\alpha+\beta) &= \cos\alpha\cos\beta - \sin\alpha\sin\beta \\
\cos(\alpha-\beta) &= \cos\alpha\cos\beta + \sin\alpha\sin\beta \\
\sin(\alpha+\beta) &= \sin\alpha\cos\beta + \cos\alpha\sin\beta \\
\sin(\alpha-\beta) &= \sin\alpha\cos\beta - \cos\alpha\sin\beta
\end{aligned}$$

Double-angle Formulas

$$\begin{aligned}
\sin(2\theta) &= 2\sin\theta\cos\theta \\
\cos(2\theta) &= \cos^2\theta - \sin^2\theta \\
\cos(2\theta) &= 2\cos^2\theta - 1 \\
\cos(2\theta) &= 1 - 2\sin^2\theta
\end{aligned}$$

Half-angle Formulas

$$\begin{aligned}
\sin^2\frac{\alpha}{2} &= \frac{1-\cos\alpha}{2} \\
\cos^2\frac{\alpha}{2} &= \frac{1+\cos\alpha}{2}
\end{aligned}$$

1. Romeo is trying to help Juliette escape from her second floor window. Romeo is trying to figure out how many bedsheets Juliette will need to sew together in order to make herself a rope long enough to reach the ground. He figured out that the angle of elevation from the ground to her window was $40°$ at a point 25 feet away from the building. What is the distance from the window to the ground?

   (a) 16 feet
   (b) 19 feet
   (c) 21 feet
   (d) 30 feet

2. If $a = 55$, $A = 32°$, $B = 75°$, then b is

   (a) 62.6
   (b) 30.2
   (c) 28.2
   (d) 100.3

3. Solve the triangle: $b = 4$, $c = 1$, $A = 120°$.

   (a) $a = \sqrt{21}$, $B = 49.11°$, $C = 10.89°$
   (b) $a = \sqrt{21}$, $B = 46.10°$, $C = 13.90°$
   (c) $a = \sqrt{13}$, $B = 49.11°$, $C = 10.89°$
   (d) $a = \sqrt{13}$, $B = 46.10°$, $C = 13.90°$

4. Compute the product $(-3+i)(2+7i)$, and put your answer in standard form.

   (a) $-13+19i$
   (b) $1+19i$
   (c) $-13-19i$
   (d) $-1-19i$

5. The modulus of the number $z=3-4i$ is

   (a) 1
   (b) 3
   (c) 5
   (d) 7

6. The argument of $(1+i)^4$ is

   (a) $180°$
   (b) $135°$
   (c) $45°$
   (d) $90°$

7. (*10 points*) For $f(x) = 3\sin 2x$, find $f^{-1}(x)$ and give its domain.

8. (*10 points*) Write $\sin 3\theta$ as a polynomial in $\sin\theta$.

9. (*10 points*) Prove the following three "product to sum" formulas, using the sum/difference formulas and/or the fundamental identities.

$$\begin{aligned}
\sin\alpha\sin\beta &= \tfrac{1}{2}(\cos(\alpha-\beta)-\cos(\alpha+\beta)) \\
\cos\alpha\cos\beta &= \tfrac{1}{2}(\cos(\alpha-\beta)+\cos(\alpha+\beta)) \\
\sin\alpha\cos\beta &= \tfrac{1}{2}(\sin(\alpha+\beta)+\sin(\alpha-\beta))
\end{aligned}$$

10. (*10 points*) Solve the equation on the interval $0 \le \theta < 2\pi$.

$$\cos\left(2\theta - \frac{\pi}{2}\right) = -1$$

11. (*12 points*) For the triangle $a = 10$, $b = 16$, $A = 30°$,

    (a) Solve the triangle.

    (b) Find the area of the triangle.

12. (*12 points*) Find the fourth roots of $2 + 2i$.

Scratch paper. (*If you want your work on this page to be graded, make sure to label your work according to the problem you're solving, and make sure to write a note next to the original problem.*)