HOMEWORK 11 - MATH 140

DUE DATE: Monday, November 29
INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. One part of each homework problem will be chosen at random and graded. Each question is worth 1 point. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. A loading ramp 10 feet long that makes an angle of 18° with the horizontal is to be replaced by one that makes an angle of 12° with the horizontal. How long is the new ramp?

2. Prove that in any triangle $\triangle ABC$ with sides a, b, c and angles α, β, γ, across from a, b, c, respectively, the following relation holds:
$$a = b\cos\gamma + c\cos\beta.$$

3. Solve the triangle $\triangle ABC$, such that:
   (a) $a = 6, b = 4$ and $\gamma = 60°$
   (b) $a = 3, b = 3$ and $c = 4$

4. Use a Half-angle Formula and the Law of Cosines to show that, for any triangle $\triangle ABC$,
$$\cos\frac{\gamma}{2} = \sqrt{\frac{s(s-c)}{ab}}, \quad \text{where} \quad s = \frac{a+b+c}{2}.$$

5. Find the area of each triangle $\triangle ABC$:
   (a) $a = 2, c = 1$ and $\beta = 10°$
   (b) $a = 4, b = 3$ and $c = 6$

6. If h_a, h_b and h_c are the altitudes dropped from A, B, and C, respectively, in the triangle $\triangle ABC$, show that
$$\frac{1}{h_a} + \frac{1}{h_b} + \frac{1}{h_c} = \frac{s}{K},$$
where K is the area of triangle $\triangle ABC$ and $s = \frac{a+b+c}{2}$ its semiperimeter.
(**Hint:** Observe that $h_a = \frac{2K}{a}$ etc.)

7. For the points $(4, \frac{3\pi}{4})$ and $(-3, 4\pi)$ given in polar coordinates, plot each point **cleanly** and find other polar coordinates (r, θ), such that, first $r > 0, -2\pi \leq \theta < 0$ and, then, $r < 0, 0 \leq \theta < 2\pi$.

8. Convert the first two to rectangular and the last three to polar coordinates:
   (a) $(4, \frac{3\pi}{2})$
   (b) $(-2, \frac{2\pi}{3})$
   (c) $(0, -2)$
   (d) $(-3, 3)$
   (e) $(-2, -2\sqrt{3})$