Read each problem **very carefully** before starting to solve it. Each problem is worth 5 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. The angle of elevation to a balloon from one observer is $67°$, and the angle of elevation from another observer, 220 feet away, is $31°$. If the balloon is in the same vertical plane as the two observers and between them, find the distance of the balloon from the first observer.

2. Find the angle $\hat{C}$ in a triangle $\triangle ABC$, with $a = 8, b = 9$ and $c = 12$.

3. A plane traveling at 180 mph passes 400 feet directly over an observer. The plane is traveling along a straight path with an angle of elevation of 14°. Find the distance of the plane from the observer 10 seconds after the plane has passed directly overhead.

4. Show that for any triangle $\triangle ABC$,

$$\frac{a+b}{b} = \frac{\sin A + \sin B}{\sin B}.$$