2002-03 Event 2C

The first question is intended to be a quickie and is worth 1 point. Each of the next three questions is worth 2 points. Place your answer to each question on the line provided. You have 12 minutes for this event.

All questions below refer to the right \( \triangle ABC \) in Figure 1 having hypotenuse \( AC = x \), \( AB = x^2 \), \( \angle BAC = \alpha \), and \( \angle ACB = \beta \). Express each of the trigonometric functions as a number or in terms of a rationalized expression in \( x \).

1. \( \sin(\alpha + \beta) \)

2. \( \sin \frac{\alpha}{2} \)

3. \( \sin(2\alpha + \beta) \)

4. Define \( f(x) = \sin 3\alpha \). In exact form (no decimal approximations) give the coordinates of the highest and lowest points on the graph of \( y = f(x) \). You get one point for finding the highest, one point for finding the lowest.

   Highest ( , )

   Lowest ( , )

Name ____________________________________  Team ____________________________