

**Quiz 9a. Math 10-270. April 20, 2012. Name**

1. Our study of the ideal arch developed the equation  $C(x) \sin \theta(x) = -w \int_{-b}^x \sqrt{1 + f'(t)^2} dt + \text{const.}$

Draw a careful diagram of an ideal arch that includes the graph of the center curve  $y = f(x)$ . Use your diagram to explain the meaning of the terms  $C(x)$ ,  $\theta(x)$ ,  $C(x) \sin \theta(x)$ ,  $w$ , and  $b$ . Also use your diagram to explain the meaning of the integral  $\int_{-b}^x \sqrt{1 + f'(t)^2} dt$ .

2. Why did architects of the Renaissance regard the use of the number sequence 1, 2, 3, 4, . . . derived from Pythagoras's musical ratios to be of importance in the designs of their plans and elevations?

3. A string under tension has length  $L$ . Plucking it produces a tone of frequency  $f$ . What are the lengths of the strings that produce (under the same tension) the second, third, fourth, and fifth harmonics?