

Third Examination
Friday, September 29, 2000

Instructions: This exam should be done on your own paper. Your name should be on each sheet and on the back of the last sheet; the answers should appear written carefully and in order. If in doubt, show intermediate steps: Full credit may not be given, even for correct answers, unless work is arranged clearly and explained. This exam is open book, and you may use your calculator and the computers. You may leave after handing in your exam paper, but be sure to check your answers carefully. Give exact values, rather than numerical approximations, unless the problem asks for a numerical approximation. Each entire problem is worth 33 points, and one point is “free.”

1. A satellite dish has a cross sectional shape of a parabola, as shown in Figure 1. The design engineer has determined that a strip of metal reinforcing should be placed along an entire cross-section. How long should the metal strip be? You may give the answer approximately to hundredths of a foot.

Hint: First write down the equation of the parabola through $(-8, 4)$, $(0, 0)$ and $(8, 4)$.

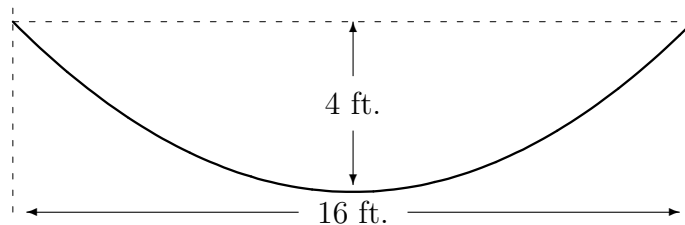


Figure 1: The parabolic cross-section for problem 1

2. What is the total force on the side wall of a cylindrical water tank 30 ft. high and 20 ft. in diameter, assuming water weighs 62.4 pounds per cubic foot? Give an exact answer and an approximate answer in scientific notation, to three significant digits.
3. Suppose the satellite dish in problem 1 (a paraboloid of revolution) fills with water. What is the total weight of the water inside the dish? Give an exact answer and an answer to the nearest pound. You may also give the answer in tons.