

Optimization. Justify all answers using methods of Calculus.

1. Farmer Bill wants to build a double bin on the side of his barn for composting. If he has 30 feet of fencing and does not have to use fence against the side of the barn determine the dimensions of the bin with the largest area.



2. *Example:* Wile E. is after Road Runner again! This time he's got it figured out. Sitting on his ACME rocket he hides behind a hill anxiously awaiting the arrival that "beeping" bird. In his excitement to light the rocket he tips the rocket up. Instead of thrusting himself parallel to the ground where he can catch the Road Runner, he sends himself widely into the air following a path given by the position function

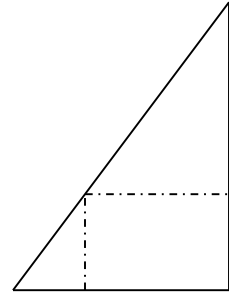
$$s(t) = -0.00086x^4 + .067x^3 - 1.67x^2 + 14.77x .$$

How high does Wile E. go, and when does he reach that height?

3. A rectangular page is 96 square inches. The margins at the top and bottom of the page are to be 1 inch, and the margins on the left and right are to be 1.5 inches. What should the dimensions of the page be so that the maximum amount of print space is available?

4. You are to design an open-top cylindrical barrel to contain 32 cubic feet. Determine the design that will contain the least amount of material?

5. A rectangle is to be inscribed in a right triangle having sides of length 6 in, 8 in, and 10 in. Find the dimensions of the rectangle with the greatest area assuming the rectangle is positioned as in the accompanying figure.



6. A box with a square bottom will be built to contain 40,000 cubic feet of grain. The sides of the box cost \$0.10 per square foot to build, the roof cost \$1 per square foot to build and the bottom cost \$7 per square foot to build. What dimensions will minimize cost?