

MCS22 – Calculus  
Exam 3 Review Sheet

*All problems must be solved using the calculus techniques shown in class.  
Show all work and justify your answers.*

1. Find two non-negative numbers whose sum is 72 and the product of one with the cube of the other is a maximum.
2. A rectangular field is to be bounded by a fence on three sides and by a straight stream on the fourth side. The field is to be divided into two sections by fencing running perpendicular to the stream. Find the dimensions of the field with maximum area that can be enclosed with 3000 feet of fence.
3. A poster is to contain a printed area of 120 square inches. There is to be a 10 inch margin on the top and bottom, and a 3 inch margin on each side. What are the dimensions of the smallest poster that can be used?
4. A cylindrical silo with a flat top is to hold  $27,000\pi$  cubic feet of grain. The floor of the silo will be the earth. Find the radius and height of the silo that requires the least material to construct.
5. The material for the bottom of a rectangular box with a square base and an open top costs \$4 per square meter and the material for the sides costs \$2 per square meter. Find the dimensions of the box of maximum volume which can be made for \$576.
6. An offshore oil well is located 2 kilometers off the coast. Oil is to be piped from the oil well to a refinery that is located 4 kilometers down the coast. Laying pipe in the ocean costs \$2 million per kilometer and only \$1 million per kilometer on land. What path should the pipe follow in order to minimize the cost?

*Answers:*

1. 18 and 54
2. 500 ft by 1,500 ft
3. 12 in by 40 in
4.  $r = 30, h = 30$
5. 8 m by 8 m by 6 m
6. The pipe should be laid in the water from the well directly to the point  $\frac{2\sqrt{3}}{3}$  km down the coast .