

**Math 141, Exam 1, Fall 2005**

Write your answers as legibly as you can on the blank sheets of paper provided. Use only **one side** of each sheet. Be sure to number your pages. Put your solution to problem 1 first, and then your solution to number 2, etc.; although, by using enough paper, you can do the problems in any order that suits you.

The exam is worth a total of 100 points. **SHOW** your work. Make your work be coherent and clear. Write in complete sentences whenever this is possible. *CIRCLE* your answer. **CHECK** your answer whenever possible. **No Calculators.**

I will post the solutions on my website shortly a few hours after the exam is finished.

1. (20 points) Graph  $y = x^2$ ,  $y = (x - 1)^2$ , and  $y = x^2 + 1$ .
2. (20 points) Graph  $y = x^{1/3}$ ,  $y = x^{2/3}$ , and  $y^2 = x^{1/3}$ .
3. (10 points) Find all lines through  $(6, -1)$  for which the product of the  $x$  and  $y$  intercepts is 3.
4. (10 points) Compute  $\sin(\cos^{-1}(2/3) + \cos^{-1}(1/3))$ .
5. (10 points) Solve  $1 + 3 \log_2 x = \log_2(3x)$ .
6. (20 points) Let  $f(x) = x - 5x^2$  for  $x \leq \frac{1}{10}$ .
  - (a) Find a formula for  $f^{-1}(x)$ .
  - (b) What is the domain of  $f^{-1}(x)$ ?
  - (c) Verify that  $f(f^{-1}(x)) = x$  for all  $x$  in the domain of  $f^{-1}$ .
  - (d) Verify that  $f^{-1}(f(x)) = x$  for all  $x$  in the domain of  $f$ .
7. (10 points) An open box is to be constructed from a rectangular sheet of metal, 8 inches by 15 inches, by cutting out squares with sides of length  $x$  from each corner and bending up the sides. Express the volume  $V$  as a function of  $x$ .