

**Problem Set 1      Calculus 2      Due 1/21/2005**

You are encouraged to work in groups of two to four on this assignment and make a single group submission. Each problem is worth 5 points. For full credit indicate clearly how you reached your answer. All work must be legible and submitted on clean paper without ragged edges.

1. The curves with equations  $x^{2p} + y^{2p} = 1$  are sometimes called “fat circles” (look at their graphs to understand why).

- a) Find the areas of the fat circles with  $p$  values of 1, 2, 3, 4, 5, and 6 to at least 5 decimal places
- b) As  $p$  grows, what do you think happens to the areas and why?

2. Have Maple evaluate the following integrals:

a)  $\int \frac{1}{(x+2)(x+5)} dx$

b)  $\int \frac{1}{(x+3)(x+1)} dx$

c)  $\int \frac{1}{(x+2)(x-3)} dx$

- d) What's the general pattern?

3. a) Find  $\int (\ln x)^n dx$  for  $n = 1, 2, 3, 4$ .

b) There is a formula relating  $\int (\ln x)^n dx$  to  $\int (\ln x)^{n-1} dx$  for any positive integer  $n$ . Guess this formula.

c) (Save this part until after Wednesday's class) Use integration by parts to verify the formula you guessed in part b.

4. Which of the following investments gives the largest total return:

- a) One paying \$1000 per year for 10 years
- b) One paying a steadily increasing amount, beginning at \$0 per year but ending at \$2000 per year, for 10 years.
- c) One paying an amount given by  $p(t) = 40t^2$  dollars per year for ten years.