250 EXTRA
DUE TH May 9 at 3:30. DEAD CAT DAY: TU May 14 at 3:30
On Tu May 14 I may go over it in class
On Tu May 14 I will post solutions but you need to remind me

If you do this I WILL NOT GRADE IT unless you get a grade of F, D, C in the class. If it is GOOD then I will bump you up:

F to D-

D to C-

C to B-

DO NOT ask *how good is good*. DO IT and DO IT WELL.

ADVICE: You should ALL do this as it is a good study aid.

NOTE: It does not cover topics asked after the second midterm.

1. (25 points) Let T be defined by:

   $T(0) = 1$

   $T(1) = 3$

   $(\forall n \geq 2)[T(n) \leq 4T(n-1) + 5T(n-2)]$.

   Using constructive induction find A and B, both natural numbers, such that
   $$(\forall n \geq 1)[T(n) \leq AB^n].$$

2. (25 points)

    (a) (10 points) For $0 \le x \le 15$ determine x^2 (mod 16). (You can use a calculator. You will need this for part 2 of this problem.)

    (b) (15 points) Prove that there is no $(x_1, \ldots, x_{14})$ (all natural numbers) such that :

$$x_1^4 + x_2^4 + \cdots + x_{14}^4 = 1599.$$

3. (25 points) For each of the statements below

(the ones labelled (a) and (b)) STATE if it is TRUE or FALSE.

If you write TRUE then give a PROOF.

If your write FALSE then give a COUNTEREXAMPLE.

You must clearly state TRUE or FALSE before giving your proof or counterexample.

(a) There is a rational that when cubed equals 15.

(b) If A is a set whose powerset has size 15 then A is infinite.

4. (25 points) Show that there exists a, b such that for ALL 17-colorings of the $a \times b$ grid there is a monochromatic rectangle.