Math 254-2 Exam 8: 11/18/8

Please read the exam instructions.

Notes, books, papers, calculators and electronic aids are all forbidden for this exam. Please write your answers on **the attached page only** (front and back if necessary). Indicate clearly what work goes with which problem. Cross out work you do not wish graded; incorrect work can lower your grade. You may use this first page as scratch paper; keep it for your records. Show all necessary work in your solutions; if you are unsure, show it. Extra credit may be earned by handing in revised work in class on Thursday 11/20; for details see the syllabus. Each problem is worth 10 points; your total will be doubled to fit the standard 100 point scale. You have approximately 30 minutes.

1. Carefully define the linear algebra term "linear mapping". Give two examples on $\mathbb{R}^2$.

2. Give any inner product on $\mathbb{R}^2$, OTHER than the dot product. Use your inner product to calculate $\langle u, v\rangle$ for $u = (1,3)^T, v = (2,-1)^T$.

3. Find two different functions f, g on $\mathbb{R}$, with $f \circ f = g \circ g = 1_{\mathbb{R}}$.

4. Consider all possible linear mappings from $\mathbb{R}^4$ to $\mathbb{R}^2$. What are the possible nullities and ranks of these? Give an example function for each possible combination, and indicate which functions are one-to-one and which are onto.

5. Consider the mapping $F : \mathbb{R}_2[t] \to \mathbb{R}^2$ given by $F(p(t)) = (p(3), p(-1))$. Calculate $F(p(t))$ for $p(t) = t^2 - 3t + 1$. Determine whether F is linear.

Please hand in ONLY the second page; keep this first page.

ID Code: ___________________

Please write all solutions on this page (front and back if necessary).