**ECS 17: Data, Logic, and Computing**

**Midterm**

**February 28, 2024**

***Notes:***

1. Midterm is open book, open notes…
2. You have 50 minutes, no more: I will strictly enforce this.
3. The midterm is graded over 70 points.
4. You can answer directly on these sheets (preferred), or on loose paper.
5. Please write your name at the top right of at least the first page that you turn in!

**Part I: logic (2 questions, each 10 points; total 20 points)**

**Using truth tables, establish for each of the two propositions below if it is a tautology, a contradiction, or neither.**

1. 
2. 

**Part II: proofs (5 questions, each 10 points; total 50 points)**

1. Prove that if *7n2+4* is even then *n* is even, where *n* is a natural number.
2. Let *a, b*, and *c* be consecutive integers with *a<b<c*. Show that if *a ≠ -1* and *a ≠ 3*, then 
3. Let *a* and *b* be two positive real numbers. Use a **proof by contradiction** to show that if $\frac{a}{b+1}=\frac{b}{a+1}$, then $a=b$
4. Show that $n^{2}+n+9 $is odd for all integer *n*.
5. Let *a* and *b* be 2 integers. Use a **direct proof** to show that if $a^{2}+4b^{2}-4ab $is even, then $a+2b $is even.

**Appendix**

