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

**Midterm 2**

**February 26, 2025**

***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 50 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!
6. Please, check your work!

**Exercise 1 (10 points)**

Let *a, b,* and *c* be 3 integers. Using the method of proof of your choice, show that if *abc* is even, then at least one of *a, b*, or *c* must be even.

**Exercise 2 (10 points)**

Let *n* be an integer. Give an **indirect proof** of the proposition, if $n^{2}+8n$ is odd then *5n* is odd.

**Exercise 3 (1 question, 10 points)**

Let *n* be an integer. Use a **proof by contradiction** to show that $\frac{n^{3}+n^{2}+3}{2n^{2}+6}$ is not an integer.

**Exercise 4 (1 question, 10 points)**

Let *n* be an integer. Use **a direct proof** to show that if *n* is odd, then there exists an integer *m* such that $n^{2}=8m+1$.

**Exercise 5 (1 question, 10 points)**

Let *n* be an integer. Show that *4n+3* is not a perfect square. (*An integer a is a perfect square if and only if there exists an integer b such that a=b2*).

**Appendix**

