MATH 150 - WRITTEN HOMEWORK # 8

DUE THURSDAY, APRIL 11, 2024 AT 11:59 P.M.

Instructions: Please
- (i) Submit your work to Gradescope as **one** file.
- (ii) Use the Gradescope tool to **match problems to pages** in your file.
- (iii) **Print** or **type** your name at the top of the first page.
- (iv) Write **neatly** and make sure your uploaded images are **legible**, or use LaTex or another technical typesetting application if you know how to.
- (v) Begin each problem by **writing** its statement. Use **complete sentences and statements**.
- (vi) Always **give detailed reasons** for your answers.

Problems:

Show your work clearly for each problem so that it can be understood how you arrived at your answer.

(1) *(10 points)*

   (a) Find an inverse of 19 modulo 141 in $\mathbb{Z}_{141}$.

   (b) Solve the linear congruence $19x \equiv 9 \pmod{141}$. Your answer must be in $\mathbb{Z}_{141}$.

(2) *(10 points)* Use the Chinese Remainder Theorem to find all integer solutions x to the following system of congruences:
$$x - 4 \equiv 1 \pmod 5$$
$$3x + 2 \equiv 3 \pmod 7$$
$$5x \equiv 1 \pmod 9.$$

(3) *(10 points)*

   (a) Compute $3^{7941} \bmod 7$.

   (b) Compute $6^{17} \bmod 20$.

(4) *(10 points)* Find all integers x satisfying
$$4x^2 + 4x - 3 \equiv 0 \pmod{11}.$$