Instructor: Wenqiang Feng Name: _____ solutions _____

Using what you have learned answer the following questions. Show all work if you want partial credit. If a specific method is mentioned, make sure you show that you are using that method.

(1) (3 points) Multiple choice. Circle the correct answer choice.

1. Let $\varphi = 1 + \frac{1}{1 + \frac{1}{1 + \cdots}}$, the Golden ratio Identity that comes from this is:

   A. $\varphi = \frac{1}{\varphi}$ B. $\varphi = 1 + \varphi$ C. $\varphi = 1 + \frac{1}{\varphi}$ D. $\varphi = \varphi + \frac{1}{\varphi}$

2. What are the prime factors of 120?

   A. $2, 3, 5$ B. 1, 2, 3, 5   C. 120 is prime   D. 2, 3, 4, 5, 6, 8, 10, 12, 15, 20

3. Which of the following pairs of numbers is a Twin Prime set?

   A. 7 and 11   B. 7 and 9   C. 3 and 5   D. 2 and 3

(2) (3 points) Find all the prime numbers in the following table:

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

Solution. 2, 3, 5, 7, 11, 13, 17, 19, 23.   ◀

(3) (4 points) Solve the quadratic equation to find the value for Golden Ratio.

Solution. Since the Golden Ratio satisfies

$$\varphi = 1 + \frac{1}{\varphi},$$

then $\varphi^2 - \varphi - 1 = 0$. From the Quadratic formula, we have

$$\varphi = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{1 \pm \sqrt{5}}{2}.$$

Since the ratio is positive, hence

$$\varphi = \frac{1 + \sqrt{5}}{2}.$$

◀

(4) (Bonus 2 points) Find the proper integers such that the division algorithm holds for the following equation.

$$-55 = 10 * (-6) + \underline{5}.$$

$$4)\overline{500} \quad \text{(Example)}$$

$$10)\overline{-55} \quad \text{(Explanations)}$$
$$\underline{-60} \quad (-6 \times 10 = -60)$$
$$5 \quad (-55 - (-60) = 5)$$

$$4)\overline{500} \quad \text{(Example)}$$
$$\underline{4} \quad (4 \times 1 = 4)$$
$$10 \quad (5 - 4 = 1)$$
$$\underline{8} \quad (4 \times 2 = 8)$$
$$20 \quad (10 - 8 = 2)$$
$$\underline{20} \quad (4 \times 5 = 20)$$
$$0$$