Name: _____

Please show all work.

1. Find all simultaneous solutions to the system of equations

$$3x \equiv 4 \bmod 8$$

$$3x \equiv 8 \bmod 7$$

2. Fibonacci numbers f_n $(n \geq 0)$ are defined recursively by $f_0 = 0, f_1 = 1$ and for $n > 1$

$$f_n = f_{n-1} + f_{n-2}$$

   (a) Compute the Fibonacci numbers for $n \leq 10$
   (b) Prove that $f_n < 2^n$ for all $n \geq 0$

3. Let $z = \dfrac{1 + 5i}{1 + i\sqrt{2}}$

   (a) Simplify z
   (b) Find the real and imaginary parts of z
   (c) Sketch z in the complex plane.
   (d) Find $|z|$

   Hint: to save work, first find $|1 + 5i|$ and $|1 + i\sqrt{2}|$

1	2	3	total (30)