

Part 15

$$4) 45^{-1} \bmod 157$$

$$1 \times 45 \bmod 157 = 45$$

$$2 \times 45 \bmod 157 = 90$$

$$3 \times 45 \bmod 157 = 135$$

$$4 \times 45 \bmod 157 = 23$$

$$5 \times 45 \bmod 157 = 68$$

$$6 \times 45 \bmod 157 = 113$$

$$7 \times 45 \bmod 157 = 1$$

$$45^{-1} \bmod 157 = 7$$

5) First, solve for $x \rightarrow$

$$f(x) = (20x + 87) \% 93$$

Solve for $20^{-1} \bmod 93$

$$f(x) = 87 = 20x \% 93$$

Extended Euclidean

$$20x = (f(x) - 87) \% 93$$

We find $20^{-1} \bmod 93 = 47$

So the decryption

function would be

$$f^{-1}(x) = (14x + 84) \% 93$$

$$20x = (f(x) - 87) \% 93$$

$$14(20x) = 14(f(x) - 87) \% 93$$

$$x = (14f(x) - 1218) \% 93 \rightarrow x = (14f(x) + 84) \% 93$$

$$6) \frac{10 \cdot 9 + 30 \cdot 21 + 50 \cdot 45 + 70 \cdot 69 + 90 \cdot 89}{250 \cdot 249} = \frac{16250}{62250} = \frac{65}{249}$$

$$7.) \frac{5 \cdot 15 + 40 \cdot 10 + 35 \cdot 35 + 70 \cdot 30 + 10 \cdot 15}{100 \cdot 105} = \frac{2150}{10500} = \frac{43}{210}$$