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Module 2: Problem Set

$$5x + 2 \equiv 3x - 7 \pmod{31}$$

- Subtract $3x$ from both sides:

$$(5x - 3x) + 2 \equiv -7 \pmod{31}$$

$$2x + 2 \equiv -7 \pmod{31}$$

- Subtract 2 from both sides:

$$2x \equiv -9 \pmod{31}$$

- Since $-9 \mod 31 = 22$, we rewrite:

$$2x \equiv 22 \pmod{31}$$

- Multiply both sides by the modular inverse of 2 modulo 31. The inverse of 2 modulo 31 is 16, because:

$$2 \times 16 = 32 \equiv 1 \pmod{31}$$

  So:

$$x \equiv 16 \times 22 = 352 \equiv 11 \pmod{31}$$

Final Answer:

$$x \equiv 11 \pmod{31}$$