5-2 Solving Systems by Substitution

EQ: How can you solve a linear system of equations using the substitution method?

	Example 1: $3x + y = 7$, $2x + 4y = 8$	Example 2: $x - 6y = -11$, $3x - 2y = -1$
STEP 1: Solve for one variable in one equation. **Choose the one that requires the least steps.* * look for a coefficient of 1	$3x+y=7$ $-3x \quad -3x$ $y = -3x+7$	$x-6y=-11$ $+6y \quad +6y$ $x = 6y-11$
STEP 2: Substitute the resulting expression into the other equation. **At this point, you should have ONE equation with ONE variable.*	$2x+4y=8$ $2x+4(-3x+7)=8$	$3x-2y=-1$ $3(6y-11)-2y=-1$
STEP 3: Solve that equation to get the value of the first variable. * distribute * combine like terms * inverse operations	$2x+4(-3x+7)=8$ $2x-12x+28=8$ $-10x+28=8$ $-28 \quad -28$ $\frac{-10x}{-10} = \frac{-20}{-10}$ $x = 2$	$3(6y-11)-2y=-1$ $18y-33-2y=-1$ $16y-33=-1$ $+33 \quad +33$ $\frac{16y}{16} = \frac{32}{16}$ $y = 2$
STEP 4: Substitute that value into one of the original equations and solve.	$3x+y=7$ $3(2)+y=7$ $6+y=7$ $-6 \quad -6$ $y=1$	$x-6y=-11$ $x-6(2)=-11$ $x-12=-11$ $+12 \quad +12$ $x=1$
STEP 5: Write the values from steps 3 and 4 as an ordered pair (x, y) and check.	$(2, 1)$ $3x+y=7$: $3(2)+1=7$, $6+1=7$, $7=7$ ✓ $2x+4y=8$: $2(2)+4(1)=8$, $4+4=8$, $8=8$ ✓	$(1, 2)$ $x-6y=-11$: $1-6(2)=-11$, $1-12=-11$, $-11=-11$ ✓ $3x-2y=-1$: $3(1)-2(2)=-1$, $3-4=-1$, $-1=-1$ ✓