SOLVING SYSTEMS OF EQUATIONS ALGEBRAICALLY

Solve each system using the **_substitution_** method.

1) $x + 2y = 11$
         $x = 2y - 1$

Plug $(2y - 1)$ in for x in the 1ˢᵗ equation.
$2y - 1 + 2y = 11$
$4y - 1 = 11$ $x = 2(3) - 1$
$4y = 12$ $x = 5$
$y = 3$
plug 3 into   Answer:
either equation $(5, 3)$

2) $3x + y = 0$
         $x + y = -2$

Get a variable by itself: $y = 0 - 3x$
Plug into other equation.
$x + 0 - 3x = -2$ $y = 0 - 3(1)$
$-2x = -2$ $y = -3$
$x = 1$
plug 1 into   Answer:
either equation $(1, -3)$

> When is it appropriate to use the substitution method?
>
> Does one of the equations have a variable by itself or would it be easy to get one by itself?

Solve each system using the **_elimination_** method.

3) $6x - 5y = -18$
         $-4x + 5y = 8$

Add (combine) straight down, solve.
$6x - 5y = -18$
$-4x + 5y = 8$ $-4(-5) + 5y = 8$
$2x = -10$ $20 + 5y = 8$
$x = -5$ $5y = -12$
plug -5 into $y = -12/5$
either equation $(-5, -12/5)$

4) $2y - x = -1$
         $3y + 2x = 30$

Multiply the top equation by 2 so that when you add down the "x" will cancel.

$4y - 2x = -2$ $2(4) - x = -1$
$3y + 2x = 30$ $8 - x = -1$
$7y = 28$ $-x = -9$
$y = 4$ $x = 9$
                                   $(9, 4)$

> When is it appropriate to use the elimination method?
>
> Will one of the variables cancel out (eliminate) if you add the two equations together? Or, can you multiply one equation by a whole number, then add them together?

Solve using either algebraic method.

5) $x + 2y = 5$
         $3x - 15 = -6y$

Easy to get x by itself in the top equation.
$x = 5 - 2y$
                                   true statement
$3(5 - 2x) - 15 = -6y$ answer: infinite
$15 - 6y - 15 = -6y$ solutions
$-6y = -6y$
$0 = 0$

6) $2x + 5y = 10$
         $3x + 4y = 12$

Multiply the top equation by 3 and the bottom one by -2 (there are other ways!)
$6x + 15y = 30$
$-6x - 8y = -24$ start over, mult top
$7y = 6$ by 4, bottom by -5
$y = 6/7$ $8x + 20y = 40$
plug 6/7 in or... $-15x - 20y = -60$
                                      $-7x = -20$
$(6/7, 20/7)$ $x = 20/7$

7) $3x - y = 9$
         $7x - 5y = 25$

Either way is good!
$-15x + 5y = -45$
$7x - 5y = 25$ $3(2.5) - y = 9$
$-8x = -20$ $7.5 - y = 9$
$x = 2.5$ $-y = 1.5$
                                   $y = -1.5$
                    $(2.5, -1.5)$