

## Math Practice

Problems 1-3 - Solve the equation for  $x$  using the following techniques: (a) symbolically with paper and pencil, (b) using the SageMath software, and (c) graphically by setting the left-hand-side equal to  $y_1$  and the right-hand-side equal to  $y_2$  and seeing where the two lines intersect.

1)  $10 - 5(x + 3) = 3x - 9$

Solution –

(a) Distribute the  $-5$  to the  $x$  and the  $3$ :

$$10 - 5x - 15 = 3x - 9$$

Bring like terms to the same side of the equation and combine them:

$$4 = 8x$$

Divide both sides by  $8$ :

$$x = \frac{1}{2}.$$

(b) Run the following SageMath script:

```
x, y1, y2 = var("x y1 y2")
y1 = 10 - 5*(x + 3)
y2 = 3*x - 9
solve([y1 == y2], x)
```

(c) Run the following SageMath script:

```
p1 = plot(y1, (x, 0, 2), color="red")
p2 = plot(y2, (x, 0, 2), color="blue")
g = Graphics()
g += p1
g += p2
g.show()
```

$$2) \frac{6}{x+2} + \frac{2}{x-4} = \frac{-7}{x^2-2x-8}$$

3)  $x^2 + 5x = -1$

4) Find an equation for the line that passes through the points  $(-2, 3)$  and  $(6, 7)$ .

Problems 5-6 - Solve the system of equations using the following techniques: (a) symbolically with paper and pencil, and (b) using the SageMath software.

5)  $3.5x + 4.1y = -18$ ,  $6.2x - 11.5y = 30$

Solution –

(a) Solve the first equation for  $y$ :

$$y = \frac{-18-3.5x}{4.1}$$

Plug this into the second equation:

$$6.2x - 11.5 \left( \frac{-18-3.5x}{4.1} \right) = 30$$

Solve this for  $x$ :

$$x = -1.28$$

Now use this  $x$  to solve for  $y$ :

$$y = \frac{-18-3.5(-1.28)}{4.1} = -3.30.$$

(b) Run the following in SageMath:

```
x, y = var("x, y")
solve([3.5*x + 4.1*y == -18, 6.2*x - 11.5*y == 30], x, y)
```

6)  $55.3x - 12.5 = 9.7y + 3.1$ ,  $5.2y = 8.8x - 22.6$