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:

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

(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:

$$y = \frac{-16-2.5x}{3.1}$$

Plug this into the second equation:

$$5.2x - 10.5\left(\frac{-16-2.5x}{3.1}\right) = 29$$

Solve this for x:

$$x = -1.28$$

Now use this x to solve for y:

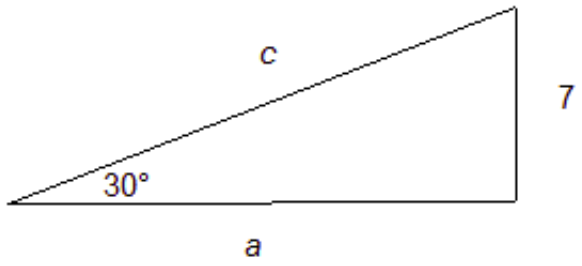
$$y = \frac{-16-2.5(-1.28)}{3.1} = -3.30.$$

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

7) Find the unknown sides and angle of the right triangle shown below.



8) A pole leans away from the sun at an angle of 7° to the vertical, as shown below. When the elevation of the sun is 55°, the pole casts a shadow 42 feet long on the level ground. How long is the pole? Round the answer to the nearest tenth.