

Name: Caleb McWhorter — Solutions

MATH 101

Fall 2022

HW 16: Due 11/09

*“From a child, I had an inordinate desire for knowledge and especially music, painting, flowers, and the sciences, algebra being one of my favorite studies.”*

*– George Washington Carver*

**Problem 1.** (10pt) Find the line perpendicular to  $y = \frac{3}{2}x + 6$  that passes through its  $x$ -intercept.

**Solution.** Because the line is perpendicular to  $y = \frac{3}{2}x + 6$ , the line has the form  $y = mx + b$ . The line  $y = \frac{3}{2}x + 6$  has slope  $\frac{3}{2}$ . Therefore, the line has slope  $m = -\frac{2}{3}$ . The  $x$ -intercept of  $y = \frac{3}{2}x + 6$  occurs when  $y = 0$ . But then we have...

$$y = \frac{3}{2}x + 6$$

$$0 = \frac{3}{2}x + 6$$

$$-\frac{3}{2}x = 6$$

$$-\frac{2}{3} \cdot -\frac{3}{2}x = -\frac{2}{3} \cdot 6$$

$$x = -4$$

Therefore, the  $x$ -intercept of  $y = \frac{3}{2}x + 6$  is  $(-4, 0)$ . Because the line contains the point  $(-4, 0)$ , we have...

$$y = mx + b$$

$$y = -\frac{2}{3}x + b$$

$$0 = -\frac{2}{3} \cdot -4 + b$$

$$0 = \frac{8}{3} + b$$

$$b = -\frac{8}{3}$$

Therefore, the line is  $y = -\frac{2}{3}x - \frac{8}{3}$ .

**Problem 2.** (10pt) Solve the following equation:

$$3(x - 1) = 1 - 8x$$

**Solution.** We have...

$$3(x - 1) = 1 - 8x$$

$$3x - 3 = 1 - 8x$$

$$11x - 3 = 1$$

$$11x = 4$$

$$x = \frac{4}{11}$$

We can easily check/verify this solution:

$$3(x - 1) \stackrel{?}{=} 1 - 8x$$

$$3\left(\frac{4}{11} - 1\right) \stackrel{?}{=} 1 - 8 \cdot \frac{4}{11}$$

$$3\left(\frac{4}{11} - \frac{11}{11}\right) \stackrel{?}{=} 1 - \frac{32}{11}$$

$$3 \cdot \frac{-7}{11} \stackrel{?}{=} \frac{11}{11} - \frac{32}{11}$$

$$-\frac{21}{11} = -\frac{21}{11}$$

✓