Quiz Solution

1. Given the function values $f(1) = -\frac{1}{2}$ and $f(-3) = 5$, write a linear function $f(x) = mx + b$.

   $f(1) = -\frac{1}{2}$ is $\left(1, -\frac{1}{2}\right)$ as an ordered pair. $f(-3) = 5$ is $(-3,5)$ as an ordered pair.

   To find a linear function we need the same information that we needed to find a linear function; either one point that the line passes through and the slope of the line (which we do not have), or two points that the line passes through (which we do have). So we will use our two points to find the slope of the line, then use the slope and one of those points to find the linear function.

$$m = \frac{\Delta f(x)}{\Delta x}$$

$$m = \frac{5.5}{-4}$$

$$m = -\frac{55}{40}$$

$$m = -\frac{11}{8}$$

   Now that we have the slope of the line, choose one of the two points that the line passes through to find the linear function, along with the slope.

$$f(x) - f(x_1) = m(x - x_1)$$

$$f(x) - 5 = -\frac{11}{8}\big(x - (-3)\big)$$

$$f(x) - 5 = -\frac{11}{8}(x + 3)$$

$$f(x) - 5 = -\frac{11}{8}x - \frac{33}{8}$$

$$f(x) = -\frac{11}{8}x - \frac{33}{8} + 5$$

$$f(x) = -\frac{11}{8}x - \frac{33}{8} + \frac{40}{8}$$

$$\boldsymbol{f(x) = -\frac{11}{8}x + \frac{7}{8}}$$

2. In 2004, in-state tuition at Purdue was \$6,092. In 2013, in-state tuition was \$9,992. Assuming that the cost of in-state tuition C is a linear function of time t, where t represents the number of years since 2004. Write the linear function $C(t)$.

Start by writing two ordered pairs, one to represent the cost of in-state tuition in 2004 (which will be time 0, since it was 0 years after 2004), and the other to represent the cost of in-state tuition in 2013 (which will be time 9, since it was 9 years after 2004). Since our linear function will be $C(t)$, where time t is the input and cost C is the output, our ordered pairs will be set-up as (t, C).

$$(0, 6092), (9, 9992)$$

Next I will use our two points to find the slope of the line, then I will use the slope and one of those points to find the linear function.

$$m = \frac{\Delta C(t)}{\Delta t}$$

$$m = \frac{3900}{9}$$

$$m = \frac{1300}{3}$$

Now that I have the slope of the line, choose one of the two points that the line passes through to find the linear function, along with the slope.

$$C(t) - C(t_1) = m(t - t_1)$$

$$C(t) - 6092 = \frac{1300}{3}(t - 0)$$

$$C(t) - 6092 = \frac{1300}{3}t$$

$$\boldsymbol{C(t) = \frac{1300}{3}t + 6092}$$

3. The manager of a band gets paid \$5,000 a show plus 5% commission on the ticket sales of x dollars.

   a. Write a linear function that represents the manager's total pay, P (in dollars), as function of x.

$$\boldsymbol{P(x) = 0.05x + 5000}$$

   b. What value of x will result in the manager earning \$10,000 for a single show?

Replace $P(x)$ with \$10,000 and solve for x.

$$P(x) = 0.05x + 5000$$

$$10000 = 0.05x + 5000$$

$$5000 = 0.05x$$

$$100000 = x$$

$$\boldsymbol{x = 100{,}000}$$

<u>\$100,000</u> in ticket sales result in the manager earning \$10,000 for a single show.