

## Quiz #3

**Directions:** Carefully read each question below and answer to the best of your ability in the space provided. You **MUST** show your work to receive full credit!

1. (5 points) When  $\log y$  is graphed as a function of  $x$ , a straight line results. Determine the functional relationship between  $x$  and  $y$ .

$$(x_1, y_1) = (1, 1) \quad \text{and} \quad (x_2, y_2) = (7, 5).$$

**Solution:** We are going to use the second method. That is

$$\begin{array}{ccc} (x_1, y_1) = (1, 1) & \text{and} & (x_2, y_2) = (7, 5) \\ \downarrow & & \downarrow \\ (x_1, Y_1) = (1, \log(1)) & \text{and} & (x_2, Y_2) = (7, \log(5)) \\ \parallel & & \parallel \\ (x_1, Y_1) = (1, 0) & \text{and} & (x_2, Y_2) = (7, \log(5)) \end{array}$$

Now, let's find the slope:

$$m = \frac{Y_2 - Y_1}{x_2 - x_1} = \frac{\log(5) - 0}{7 - 1} = \frac{1}{6} \cdot \log(5).$$

Since we know points on the line and the slope of the line, we can use point-slope equation to find the desire formula. We are going to use the point  $(x_1, Y_1) = (1, 0)$ , so

$$\begin{aligned} Y - Y_1 = m(x - x_1) & \rightsquigarrow Y - 0 = \frac{1}{6} \cdot \log(5)(x - 1) & \rightsquigarrow \log(y) = \log\left(5^{\frac{x-1}{6}}\right) \\ & \rightsquigarrow \boxed{y = 5^{\frac{x-1}{6}} = 5^{-1/6} \cdot 5^{x/6} \approx (0.764726) \cdot (1.30766)^x.} \end{aligned}$$

2. (5 points) Consider the relationship  $y = 5 \times 3^{-x/6}$  between the quantities  $x$  and  $y$ . Use a logarithmic transformation to find a linear relationship of the form  $Y = mx + b$  between the given quantities.

**Solution:** Consider the following logarithmic transformation:

$$\begin{aligned} y = 5 \times 3^{-x/6} & \rightsquigarrow \log(y) = \log\left(5 \cdot 3^{-x/6}\right) \\ & \rightsquigarrow \log(y) = \log(5) + \log\left(3^{-x/6}\right) \\ & \rightsquigarrow \log(y) = \log(5) - \frac{1}{6} \log(3)x \\ & \rightsquigarrow \boxed{Y = \log(5) - \frac{1}{6} \log(3)x.} \end{aligned}$$

Name: \_\_\_\_\_

Section (circle one):            003            004

Question:	1	2	Total
Points:	5	5	10
Score:			