3. [13 points] In part (a) of this problem, you should **show your work** and make sure your answers are **exact**. Note that *part (b) is independent of part (a).*

a. [9 points] There are $T(d)$ termites in an abandoned house on day d. Starting at $d = 0$, the population of termites increases by 30% each day, and reaches a peak of 28,561 termites at $d = 4$. Starting at $d = 4$, the termite population declines at a constant rate, up until $d = 8$ when there are no termites left. Write a *piecewise-defined* formula for $T(d)$ in terms of d *in the spaces provided.*

Solution: From the information above, we see that $T(d)$ is exponential on $0 \le d \le 4$ and linear on $4 < d \le 8$.

For $0 \le d \le 4$: We know $T(d)$ is exponential with percentage growth rate 0.3, so $T(d) = a(1.3)^d$. To find a, we know that $T(4) = 28,561$, so $a(1.3)^4 = 28,561$. Dividing by 1.3^4 gives us $a = 10,000$.

For $4 < d \le 8$: We know $T(d)$ is linear with average rate of change:

$$\frac{0 - 28,561}{4} = -7,140.25$$

Since $T(8) = 0$, using point-slope form gives us $T(d) = -7,140.25(d - 8)$.

$$T(d) = \begin{cases} 10,000(1.3)^d & \text{if } 0 \le d \le 4 \\ -7,140.25(d-8) & \text{if } 4 < d \le 8 \end{cases}$$

b. [4 points] The termites at the abandoned house have begun attracting birds. The number of birds B, along with the temperature T (in °F) and the wind speed W (in miles per hour) have been recorded at various times h, where h is measured in hours after 8 a.m. on October 10.

h	0	1	2	3	4	5
B	10	11	15	13	11	5
T	30	33	40	39	33	31
W	14	10	13	12	11	10

Based on the table above, which of the following statments *could* be true about h, B, T and W? **Circle all that apply**.

B is a function of T	*T is a function of B*	*W is a function of B*
B is a function of W	*h is a function of T*	*W is a function of T*