

$$T = 0.2t + 100$$

$$t(T) = ?$$

$$T - 100 = 0.2t$$

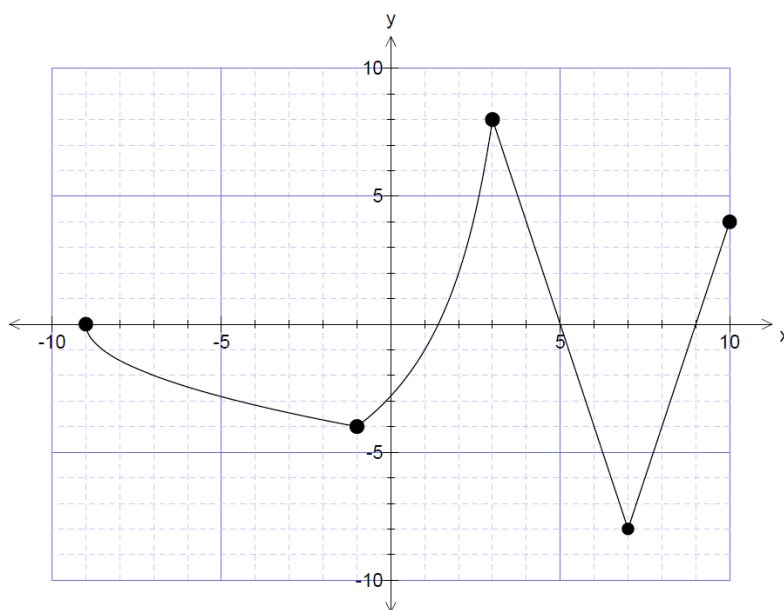
$$\frac{T - 100}{0.2} = t \quad t(T) = 5T - 500$$

$$L = 100 + 0.0001t$$

$$L = 100 + 0.0001(5T - 500)$$

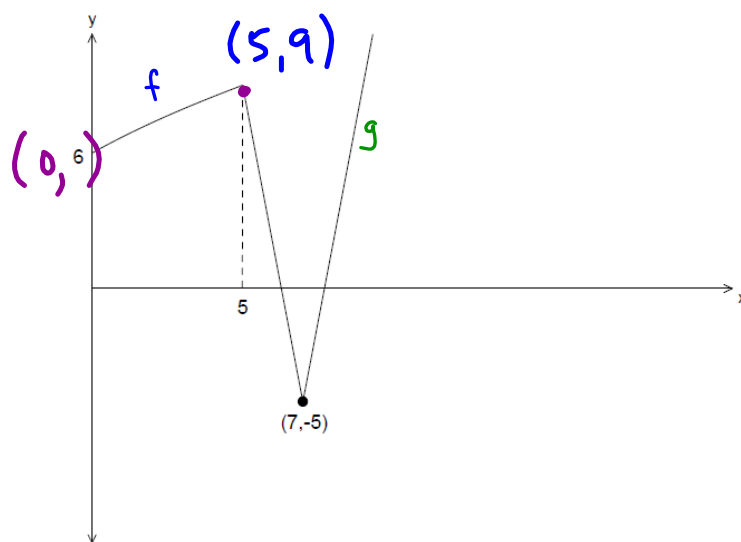
$$L(T) = 99.5 + 0.0005T$$

2. The following graph represents a square root function (beginning at its vertex), followed by a rational function with asymptotes at  $x = 5$  and  $y = -10$ , and finally an absolute value function. Write the rule for the piecewise function.



$$f(x) = \begin{cases} -\sqrt{2(x+9)} & -9 \leq x \leq -1 \\ \frac{-36}{x-5} - 10 & -1 \leq x \leq 3 \\ 4|x-7|-8 & 3 \leq x \leq 10 \end{cases}$$

3. The height of a sea-faring bird (in metres) was recorded over a period of 12 seconds and is shown in the graph below. The first part of the graph is a square root function with vertex  $(-4, 0)$  and the second part is an absolute value function. What will the height of the bird be at the 12 second mark?



$$f(x) = 3\sqrt{x+4}$$

$$f(5) = 9$$

$$g(x) = 7|x-7| - 5$$

$$g(12) = 30$$

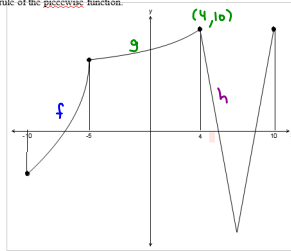
2. The piecewise function shown represents a square root function, followed by a rational function and then an absolute value function.

The square root function in the form  $y = -5\sqrt{-(x-h)} + k$  has a domain of  $[-10, -5]$ , passes through the point  $(-9, -3)$  and its vertex is at  $x = -5$ .

The rational function has a domain of  $[-5, 4]$ , has a vertical asymptote at  $x = 10$  and an initial value of 8.

The absolute value function is in the form  $y = \frac{20}{3}|x-h| + k$  and has a domain of  $[4, 10]$ . The  $y$ -values at  $x = 4$  and  $x = 10$  are equivalent.

State the rule of the piecewise function.



$$f(x) = -5\sqrt{-(x+5)} + 7$$

$$g(x) = \frac{-30}{x-10} + 5$$

$$y = \frac{a}{x-10} + k \quad (-5, 7) \quad (0, 8)$$

$$7 = \frac{a}{-5-10} + k \quad 8 = \frac{a}{0-10} + k$$

$$7 = \frac{a}{-15} + k \quad 8 = \frac{a}{-10} + k$$

$$7 - k = \frac{a}{-15} \quad 8 - k = \frac{a}{-10}$$

$$-15(7-k) = a \quad -10(8-k) = a$$

$$-105 + 15k = a \quad -80 + 10k = a$$

$$-105 + 15k = -80 + 10k$$

$$-25 = -5k$$

$$k = 5$$

$$a = -105 + 15(5)$$

$$a = -30$$

$$y = \frac{20}{3}|x-h| + k \quad \text{By symmetry } h = \frac{4+10}{2}$$

$$h = 7$$

$$y = \frac{20}{3}|x-7| + k$$

$$g(4) = \frac{-30}{4-10} + 5 \quad (4, 10)$$

$$= \frac{-30}{-6} + 5$$

$$= 10$$

$$10 = \frac{20}{3}|4-7| + k$$

$$10 = \frac{20}{3}|3| + k \quad h(x) = \frac{20}{3}|x-7| - 10$$

$$10 = 20 + k$$

$$k = -10$$

$$j(x) = \begin{cases} -5\sqrt{-(x+5)} + 7 & -10 \leq x \leq -5 \\ \frac{-30}{x-10} + 5 & -5 \leq x \leq 4 \\ \frac{20}{3}|x-7| - 10 & 4 \leq x \leq 10 \end{cases}$$