Manipulating quadratic and exponential expressions

The following function gives the amount of money owed on a short term loan after t weeks.

$$A(t) = 100 \cdot (1.25)^{\frac{t}{2}}$$

Which numerical expression best approximates the annual interest rate, excluding any late fees? $(1 \text{ year} = 52 \text{ weeks.})$

A $1 - 0.25^{26}$

B $1.25^{26} - 1$

C $26 \cdot 0.25$

D $26 \cdot 1.25$

The rabbit population in an isolated forest rises and falls depending on the population of predators. Within the year 2014, the population, p, in thousands of rabbits, m months after January 1, 2014 is:

$$p = 0.05(m - 1.5)(m - 8.5) + 10$$

The population reached ten thousand some time in February. At what other time, given as months after January 1, 2014, did the rabbit population reach ten thousand?

The "hang time" of a football is the amount of time the football stays in the air after being kicked. The height, in meters, of the football above the ground at time t can be modeled by the quadratic function:

$$h(t) = -4.9t^2 + 19.6t$$

Which of the following equivalent expressions displays the hang time of the football as a constant or coefficient?

A $-4.9(t - 2)^2 + 19.6$

B $-4.9t(t - 4)$

C $-4.9(t - 3)^2 - 9.8t + 44.1$

D $-4.9(t - 1)^2 + 9.8t + 4.9$

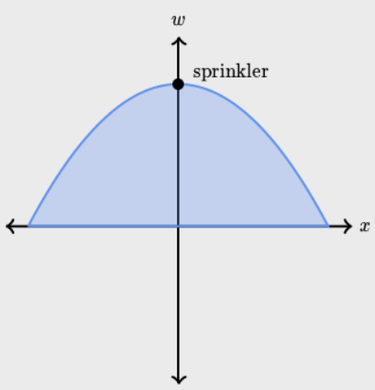
Manipulating quadratic and exponential expressions

Kaia throws a stone vertically upward from a bridge. The height, in meters, of the stone above the water at time t can be modeled by the quadratic function:

$$h(t) = -4.9t^2 + 9.8t + 39.2$$

After how many seconds does the stone hit the water?

- (A) 1 second
- (B) 2 seconds
- (C) 4 seconds
- (D) 8 seconds



An umbrella sprinkler is positioned on a ceiling at a point whose x-coordinate is 0. Negative values of x indicate distances, in meters, to the left of the position of the sprinkler, and positive values indicate distances to the right.

The path of water from the sprinkler can be modeled by the quadratic function

$$w(x) = -\frac{1}{4}(x^2 - 12)$$

where $w(x)$ is the height of the water, in meters, at position x.

Which of the following equivalent expressions displays the height of the ceiling as a constant or coefficient?

- (A) $-\frac{1}{4}x^2 + 3$
- (B) $-\frac{1}{4}(x - \sqrt{12})(x + \sqrt{12})$
- (C) $-\frac{1}{4}(x - 2)(x + 2) + 2$
- (D) $-\frac{1}{4}(x - 4)(x + 4) - 1$