10. [14 points] Let $P(t)$ be the price of a house (in thousands of dollars) $t$ years after it was built. The function $P(t)$ is given by

$$P(t) = 5t^2 - 18t + 225.$$

a. [2 points] What is the price of the house five years after it was built? Include units.

Solution: $P(5) = 260$, then the price is 260 thousand dollars five years after it was built.

b. [3 points] Find the vertical intercept of the function $P(t)$ and provide a practical interpretation for it. Include units.

Solution: Vertical intercept $P(0) = 225$.

Practical interpretation: The price of the new house was 225 thousand dollars.

c. [5 points] Use the method of completing the square to put the formula for $P(t)$ in vertex form. Show all your algebraic work step-by-step.

Solution:

$$P(t) = 5t^2 - 18t + 225.$$

$$= 5\left(t^2 - \frac{18}{5}t\right) + 225$$

$$= 5\left(t^2 - \frac{18}{5}t + \left(\frac{1.8}{2}\right)^2 - \left(\frac{1.8}{2}\right)^2\right) + 225$$

$$= 5\left((t - 1.8)^2 - (1.8)^2\right) + 225$$

$$= 5(t - 1.8)^2 - 5(1.8)^2 + 225$$

$$= 5(t - 1.8)^2 + 208.8.$$
Let \( P(t) \) be the price of a house (in thousands of dollars) \( t \) years after it was built. The function \( P(t) \) is given by
\[
P(t) = 5t^2 - 18t + 225.
\]

d. [2 points]

What is the highest price of the house during the first 5 years after it was built? In what year was the highest price attained?

\[
\text{Solution: After 5 years:}
\]
\[
\text{Highest price} = 260 \text{ thousand dollars.}
\]
\[
\text{Highest price of the house when } t = 5.
\]

e. [2 points]

What is the lowest price of the house during the first 5 years after it was built? In what year was the lowest price attained?

\[
\text{Solution: The minimum of } P(t) \text{ is at the vertex (1.8, 208.8)}
\]
\[
\text{Lowest price} = 208.8 \text{ thousand dollars (208,800 dollars)}
\]
\[
\text{Lowest price of the house when } t = 1.8.
\]