Function Scenarios from the January 2024 Algebra I Regents

Each of the following scenarios appeared on the January 2024 Regents. Determine what quantity is changing independently (domain), and identify the type of function each represents (linear, quadratic, exponential, piecewise, etc.) and .

- A drone is flying at a height that changes according to the equation $h(t) = -16t^2 + 64t + 5$. What kind of graph models this flight?
- A company charges a base fee plus a per-mile delivery rate. The total cost depends on the number of miles traveled.
- A cell phone depreciates by 30% each year. What type of function represents the phone's value over time?
- The height of a kicked soccer ball is modeled by a quadratic function. When does the ball hit the ground?
- A gym membership costs $30 per month. How much will it cost for x months?
- A person climbs a mountain trail with changing slope, and a graph shows the elevation as a function of time.
- A population triples every 4 years. Model this population growth with an exponential function.
- A graph shows a piecewise function combining a linear portion and a constant segment.
- A savings account earns interest, compounding annually.
- A business predicts profit using $P(x) = -2x^2 + 120x - 500$ based on the number of units sold.
- An equation used to find the velocity of an object is given as $v^2 = u^2 + 2as$, where u is the initial velocity, v is the final velocity, a is the acceleration of the object, and s is the distance traveled. When this equation is solved for a, what kind of equation results?
- Which situation represents exponential growth? Aidan adds $10 to a jar each week. A pine tree grows 1.5 feet per year. Ella earns $20 per hour babysitting. The number of people majoring in computer science doubles every 5 years.
- The piecewise function $f(x)$ is defined as:

  $$f(x) = \{\, 2\, x^2 + 15, \&x \leq 32x - 3, \&x > 3$$

  State the value of $f(3)$. Justify your answer.
- Joe deposits $4000 into a certificate of deposit (CD) that earns 3% interest, compounded annually. What function models the value of the CD in x years?
- Two texting plans are advertised. Plan A has a monthly fee of $15 and charges $0.08 per text. Plan B has a monthly fee of $3 and charges $0.12 per text. If t represents the number of texts in a month, write an inequality to show when Plan A is cheaper than Plan B.

For each scenario: What is the domain? What type of change is being modeled? Use function names, context clues, and mathematical behavior to support your classification.