

MATH 1650: Project Alternative (20 points.)

NAME: _____

DUE: The Day of the Final Exam at the beginning of class.

DIRECTIONS: To receive full credit, make sure your work is neat and complete.

1. Suppose $T(t)$ for $0 \leq t \leq 12$ gives the temperature, in $^{\circ}\text{F}$, t hours after 8 AM on a particular day.

(a) What does $T(3) = 54$ mean in terms of time and temperature?

(b) What does it mean that the point $(10, 40)$ is on the graph of $y = T(t)$?

(c) Find average rate of change of T over the interval $[3, 10]$.

Interpret the average rate of change of T in terms of time and temperature.

2. Suppose $d(p)$ gives the number of items sold at a price of p dollars per item. Suppose $d(10) = 15$.

(a) Interpret the equation $d(10) = 15$ in terms of items sold and the price per item.

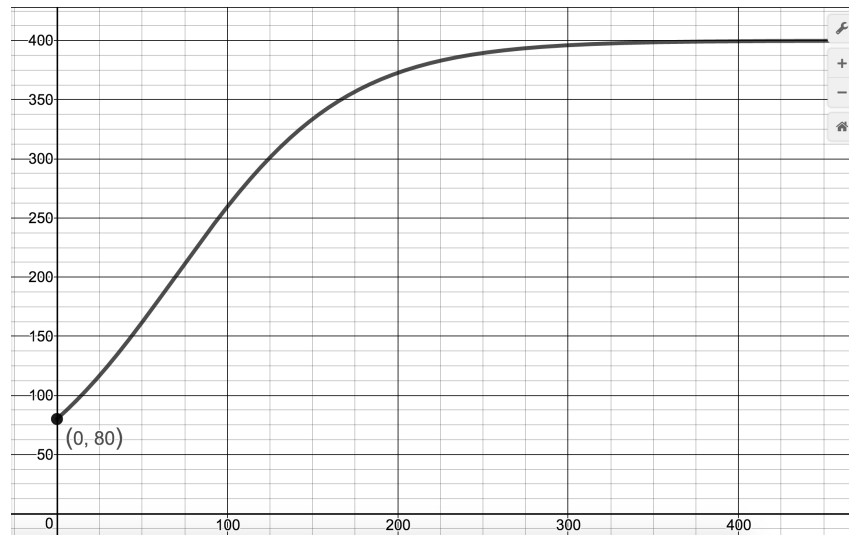
(b) Write a mathematical equation equivalent to: '5 items are sold when the price is \$25 per item.'

(c) What do the solutions of $d(x) = 20$ represent?

(d) Suppose d is invertible. What is $d^{-1}(15)$?

(e) What do the solutions of $d^{-1}(x) = 25$ represent?

3. The graph below models the population of black bears in a certain county, $P(t)$, t years after they were reintroduced in the year 2000. Use the graph to answer the following questions.



$$y = P(t)$$

- (a) What was the black bear population in 2000?
- (b) Approximate the black bear population in the year 2100.
- (c) Approximate when the black bear population will reach 300.
- (d) What appears to be the limit of the black bear population?
- (e) Is the population of black bears growing faster in the year 2100 or 2300? Explain your reasoning.

4. Find all real solutions to the following equations algebraically. Check your answers graphically.

(a) $x^2 = x + 6$

(b) $x^4 = x^2 + 6$

(c) $\frac{1}{x^2} = \frac{1}{x} + 6$

(d) $x = \sqrt{x} + 6$

(e) $e^{2x} = e^x + 6$

(f) In what sense are the equations in parts (a) through (e) the same?

5. For each scenario below, choose a function family that would likely be used to model the given scenario.

choose from: linear, quadratic, exponential growth, exponential decay, logistic growth

(a) $V(t)$ is the value of a car t years after it is purchased.

(b) $h(t)$ is the height of a basketball t seconds after it is thrown in the air.

(c) $P(t)$ is the population of wolves in Yellowstone National Park t years after they were reintroduced.

(d) $p(x)$ is the price paid for x gallons of gasoline at a local gas station on a given day.

(e) $A(t)$ is the amount in a savings account when interest is compounded continuously.