Unit 1 Test Prep

1. What are the x <u>and</u> y intercepts of the following equations? What are the slopes?
    - $6x + 7y = 42$

    - $y = 14x + 2$

    - $y = 3x - 5$

    - $y = x^2 - 9$

2. Graph these points in Desmos. What type of correlation is this?

X	2	2.5	4	8	5	6	7	7	5	9
Y	4	2	2.5	6	2	4.4	7	4.2	7	8

3. A luxury car is purchased for $85,000. After six years, its value is estimated to be $40,000. Assuming the car's value depreciates linearly:

    What is the depreciation of this function?

    How long will it be until the car is worth $0?

4. A tractor is purchased for $55,000, and after 6 years, it is now worth $37,000. Find the linear depreciation equation. How much will the tractor be worth after 15 years?

5. Find the domain and range of the following:

   ○ f(x) = 2x – 5

   ○ f(x) = (√x+3)

   ○ f(x) = 1/(x-2)

6. Is the relation between a student and their school ID number a function? What are the inputs and outputs?

7. Are the following equations functions? Make a small sketch.

   $7x - 2y = 8$

   $y^2 - x^2 = 13$

8. A small business produces custom t-shirts. Each t-shirt costs $7 to produce. The total cost to produce 150 t-shirts is $1,550.

What is the cost function equation?

Using this information, what are the fixed costs?

9. From question 4, find the average cost to produce 100 compared to 1000 units.

10. The Tillie Truffle factory has a weekly fixed cost of $30,000. It costs $3.25 to produce each box of truffles. A box of these truffles sells for $5.50.

Find the cost function to produce x boxes of truffles.

Find the revenue function from selling x boxes of truffles.

Find the profit function on x boxes of truffles.

How many boxes of truffles need to be sold to break-even?

11. The function below represents the projected sales (in thousands of dollars) for a new tech gadget over the next 10 years.

$$S(x) = 0.2x^3 - 0.5x^2 + 2x + 10$$

What are the projected sales for the current year?

What sales are expected for Year 4? Year 7?

12. The relationship between the number of years of experience (x) and the monthly salary (y) for a group of employees can be modeled by a linear regression equation. The least-squares regression line is given as $y = 3500 + 400x$, where y is the predicted monthly salary in dollars and x is the years of experience.

Interpret the value of the estimated slope b=400.

What is the predicted monthly salary for an employee with 5 years of experience?

What would the predicted monthly salary be for an employee with 30 years?

Why do you think the answer to part (d) might be inaccurate?

13. The table below shows the relationship between hours spent studying for a final exam and the final exam score for 8 students. A linear regression model for this data is:

$$y = 3.5x + 58$$

where x represents the hours spent studying and y represents the final exam score.

Hours Studied, **x**	2	4	5	6	8	9	10	12
Exam Score, **y**	65	71	75	78	86	89	93	99

Interpret the slope of the model.

Use the model to predict the final exam score for a student who studied for 7 hours.

14. In a certain city, the depth of snow in inches on a winter day can be approximated by the following piecewise function: (ignore the no bracket for the piecewise)

$$D(t) = \begin{cases} 2t+4 & \text{if } 0 \leq t \leq 6 \\ 16 & \text{if } 6 < t \leq 10 \\ -1.5t + 31 & \text{if } 10 < t \leq 16 \end{cases}$$

Here, t represents the number of hours since 10:00 A.M.

Find the depth of the snow at 2:00 P.M.

Find the depth of the snow at 8:00 P.M.

15. Determine the vertex of the parabola.

$$y = 3(x-4)^2 + 2$$

Does the parabola open up or down?

Does it have a minimum or maximum value?

What is the vertex?

16. Solve for the vertex of $x^2 - 8x + 4$ using Vertex Form.

17. Find the equilibrium quantity (q) and the equilibrium price (P).

Price-supply: S = (1/4)q^2

Price-demand: D = −2q + 32

Sketch each line