**Key**

# Unit 1 Test Prep

1. What are the x and y intercepts of the following equations? What are the slopes?

   o  $6x + 7y = 42$

   X-int $= (7, 0)$        Slope $= -\frac{6}{7}$

   Y-int $= (6, 0)$

   o  $y = 14x + 2$

   X-int $= (-.14, 0)$ or $(-\frac{2}{14}, 0)$

   y-int $= (0, 2)$        slope $= 14$

   o  $y = 3x - 5$

   X-int $= (-1.67, 0)$ or $(-\frac{3}{5}, 0)$

   y-int $= (0, 5)$        slope $= 3$

   o  $y = x^2 - 9$

   X-int $= (\pm 3, 0)$

   y-int $= (0, -9)$        slope $=$ n/a

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

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

   weak/moderate positive

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?

   $y = -7500x + 85000$

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

   $\approx 11.33$ years

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

$$y = -3000x + 55000$$

$10,000 after 15 years

5. Find the domain and range of the following:

○ f(x) = 2x – 5

$$d: (-\infty, \infty)$$

$$r: (-\infty, \infty)$$

○ f(x) = (√x+3)

$$d: [-3, \infty)$$

$$r: [0, \infty)$$

○ f(x) = 1/(x-2)

$$d: (-\infty, 2) \cup (2, \infty)$$

$$r: (-\infty, 0) \cup (0, \infty)$$

6. Is the relation between a student and their school ID number a function? What are the inputs and outputs?
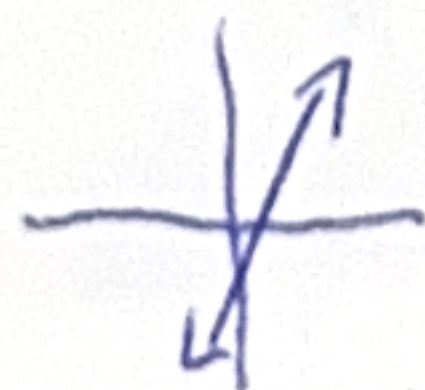
Yes, it is a function          inputs: students

outputs: ID numbers

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

7x - 2y = 8
    yes   ✗

$y^2 - x^2 = 13$   no  ✗

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?

$$C(x) = 7x + 500$$

Using this information, what are the fixed costs?

$500

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

100 units = $12 per unit

1000 units = $7.50 per unit

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.

$$C(x) = 3.25x + 30000$$

Find the revenue function from selling x boxes of truffles.

$$R(x) = 5.50x$$

Find the profit function on x boxes of truffles. $R(x) - C(x) = P(x)$

$$P(x) = 2.25x - 30000$$

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

**13,334 boxes**

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?

**$10,000**

What sales are expected for Year 4? Year 7?

**Year 4 = $22,800**

**Year 7 = $68,100**

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=~~1000~~ 400

**Salary increase per month**

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

**$5,500**

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

**$15,500**

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

**most companies have a max salary/it's capped**

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:.

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.

3.5 point increase for additional hour

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

82.5

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)

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

10am =0    2pm=4    6pm=8
11am =1    3pm=5    7pm=9
12pm =2    4pm=6    8pm=10
1pm=3    5pm=7

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

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

12 inches

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

16 inches

15. Determine the vertex of the parabola.

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

Does the parabola open up or down?

up

Does it have a minimum or maximum value?   minimum

What is the vertex?

$(4, 2)$

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

$(4, -12)$

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

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

Price-demand: $D = -2q + 32$

Quantity = 8 units

Price = 16 dollars

Sketch each line