

Practice Problems for the Maine Township Placement Exam

HSA.SSE.A.1.A (USED FOR PLACEMENT)

1. What is the leading coefficient of the following expression: $5x^4 - 7x^3 + 2x + 1$
2. What is the leading coefficient of the following expression: $4x^2 - 5x^3 - 6x$
3. What is the leading coefficient of the following expression: $8 - 9x^3 + x^2 - 6x + x^5$
4. How many terms does the following expression have: $5x - 2$
5. How many terms does the following expression have: $4x^2 - 5x^3 - 6x$
6. How many terms does the following expression have: $5 - 4x^3 + x^2 - 6x + x^5$
7. Each year from 2010 to 2015 a business recorded the number of referrals it received from Internet search engines. They found that the number of referrals from Internet search engines can be predicted by the expression $2500(1.5)^t$, where t is the number of years since 2010. What does the value 2500 represent?
 - a. The percentage referrals are expected to increase by each year
 - b. The predicted increase in the number of referrals each year
 - c. The number of referrals in 2010
 - d. The number of referrals in 2015
8. The value of a particular snowmobile (in dollars) can be predicted by the expression $3500(0.90)^t$, where t is the number of years since it was purchased. What does the 3500 represent?
 - a. The initial value of the snowmobile.
 - b. The amount by which the value of the snowmobile is predicted to increase each year.
 - c. The amount by which the value of the snowmobile is predicted to decrease each year.
 - d. The percentage by which the value of the snowmobile is predicted to decrease each year.

HSA.SSE.A.2 (USED FOR PLACEMENT)

Factor.

1. $x^2 + 2x - 24$
2. $x^2 - 36$
3. $4x^2 + 27x - 7$
4. $9x^2 - 25$
5. $6x^2 + 21x - 12$
6. $x^2 - 3x - 28$
7. $3x^2 - 4x + 4$
8. $7x + 21$

HSA.CED.A.1 (USED FOR PLACEMENT)

1. A newly hatched channel catfish typically weighs about 6 grams. During the first six weeks of life, its weight increases by about 5% each week.
 - a. Write an exponential growth equation for the growth of the catfish, include a description of your variable.
 - b. Find the weight of the catfish after 6 weeks, use correct units.

2. Johnny earns \$15 each time he mows someone's lawn. He has saved \$120 already. How many lawns will Johnny need to mow to earn enough money to buy an iPad for \$600?
 - a. Write a linear equation to represent the situation, include a description of your variable.
 - b. Solve the equation to answer the question using correct units.
3. Find a number such that 8 more than half the number is 20.
4. Find a number such that twice the number less 16 is 100.
5. The sum of a number and 3 is equal to 5 less than 3 times that number.
6. The difference of a number and 10 is equal to 5 more than half that number.

HSA.CED.A.2 (USED FOR PLACEMENT)

1. Johnny earns \$15 each time he mows someone's lawn. He has saved \$120 already. How many lawns will Johnny need to mow to earn enough money to buy an iPad for \$600?
 - a. What is the variable and what does it represent?
 - b. Set up an equation to represent the situation and solve it.
 - c. What is the answer with the correct units?
2. Caitlin is driving to Boston and has \$200 for food. Each time she stops for food she spends about \$12.
How many food stops can she make before her food money runs out ?
 - a. What is the variable and what does it represent?
 - b. Set up an equation to represent the situation and solve it.
 - c. What is the answer with the correct units?

HSA.CED.A.3 (USED FOR PLACEMENT)

1. You are in charge of buying shirts and hats for a school fundraiser. The cost of each shirt is \$10 and the cost of each hat is \$5. If you have \$700 to spend, write an inequality that represents the different number of shirts and hats you can buy.
2. 3. Shoe sizes and foot length are related by the formula $S = 3F - 24$, where S represents the shoe size and F represents the length of the foot, in inches. Solve the formula for F.
4. Solve the following equation for y: $5x - 3y = 45$
5. Solve the following equation for x: $3x - 4y = 20$
6. Solve the following equation for y: $Ax + By = C$
7. Solve the following equation for x: $y = 5x - 20$
8. Solve the following equation for x: $y = mx + b$
3. Leah would like to earn at least \$120 per month. She babysits for \$5 per hour and works at an ice cream shop for \$8 per hour. Leah cannot work more than 20 hours per month. Let x represent the number of babysitting hours and y represent the number of hours at the ice cream shop.
 - a. Write an inequality that describes this situation.
 - b. If Leah baby sits for 7 hours what is the minimum number of hours she can work at the ice cream shop to reach the \$120 for the month.
 - c. What is the maximum number of hours Leah can baby sit to reach the \$120 for the month.
 - d. Given the inequality in part a, list which of the following ordered pairs meet the criteria given: (4,15) (5,12) (10,9) (15,5) (19,1)

HSA.CED.A.4 (USED FOR PLACEMENT)

1. The displacement equals the original velocity multiplied by time plus one half the acceleration

multiplied by the square of time, and is given by the equation $d = v_0t + \frac{1}{2}at^2$. Solve this equation for a.

2. Newton's Law of gravitational force relates the mass of particles with the distance between them,

and is given by the formula $G = \frac{Fd^2}{m_1m_2}$. Solve this formula for m_2

3. Shoe sizes and foot length are related by the formula $S = 3F - 24$, where S represents the shoe size and F represents the length of the foot, in inches. Solve the formula for F.
4. Solve the following equation for y: $5x - 3y = 45$
5. Solve the following equation for x: $3x - 4y = 20$
6. Solve the following equation for y: $Ax + By = C$
7. Solve the following equation for x: $y = 5x - 20$
8. Solve the following equation for x: $y = mx + b$

HSA.REI.A.1 (USED FOR PLACEMENT)

1. Below are the steps Eliza used to correctly solve the equation

$$\frac{1}{5}(x + 3) - 2 = 18 \text{ for } x.$$

The result from Step 2 is missing.

What could Eliza have written as the result from Step 2?

$$\begin{array}{l} \text{Step 1} \\ \text{Step 2} \\ \text{Step 3} \end{array} \begin{array}{l} \left\{ \begin{array}{l} \frac{1}{5}(x + 3) - 2 = 18 \\ \frac{1}{5}(x + 3) = 20 \\ x = 97 \end{array} \right. \end{array}$$

- a) $x + 3 = 4$
- b) $x + 3 = 15$
- c) $x + 3 = 100$
- d) $x + 3 = 25$

2. The following is a student solution to the inequality

$$\begin{aligned}\frac{5}{18} - \frac{x-2}{9} &\leq \frac{x-4}{6} \\ \frac{5}{18} - \frac{x-2}{9} &\leq \frac{x-4}{6} \\ \frac{5}{18} - \frac{2x-2}{9} &\leq \frac{3x-4}{6} \\ \frac{5}{18} - \frac{2x-2}{18} &\leq \frac{3x-4}{18} \\ 5 - (2x-2) &\leq 3x-4 \\ 5 - 2x + 2 &\leq 3x-4 \\ 7 - 2x &\leq 3x-4 \\ -5x &\leq -11 \\ x &\leq \frac{11}{5}\end{aligned}$$

- There are two mathematical errors in this work. Identify at what step each mathematical error occurred and explain why it is mathematically incorrect.
 - How would you help the student understand his mistakes?
 - Solve the inequality correctly.
- State two values for x that make the statement TRUE: $x^2 = 121$
 - State two values for x that make the statement TRUE: $(x-1)(2x+1) = 0$
 - State two values for x that make the statement TRUE: $x^2 + x - 6 = 0$
 - State two values for x that make the statement TRUE: $x^2 > x^3$

HSA.APR.A.1 (NOT USED FOR PLACEMENT)

Add, subtract, or multiply.

- $(5x+2)^2$
- $(4x-8)(6x-9)$
- $(2x-1)(4x^2-2x+3)$
- $(3x-2)(3x+2)$
- $(4x-9x^2+3) + (3x-8-2x^2)$
- $(6-9x^3+x) + (3x^2-2x+8)$
- $(5x-4x^2+11) - (7x^2+2-9)$
- $(6x-8) - (4x^2-10) + (5x+7)$

HSA.REI.B.3 (USED FOR PLACEMENT)

Solve for the equation for the given variable.

- $7x-9=5$
- $\frac{b}{3}-18=32$
- $4v+16=1+v$
- $-5b+55=-9(5-5b)$
- $6-(2x+1)=2+3(x-2)+4x$

6. $(4x + 8) - 3x = 3 - 2(5 - 4x) + 1$

Solve the inequality for the given variable.

1. $-5x > 130$

2. $6g - 19 < 5$

3. $4 - 8x \geq 12x - 9$

4. $6(4 - 8p) \geq 54$

5. $4 - 3a + 18 \leq 3 - (4a - 17) + 1$

6. $\frac{2}{5}(10x + 25) > \frac{1}{2}(3x - 8)$

HSA.REI.B.4.B (NOT USED FOR PLACEMENT)

Solve for x and round to the nearest hundredth, if necessary.

1. $x^2 = 121$

2. $2x^2 - 18 = 6x$

3. $x^2 + 18 = -11x$

4. $x^2 = 24$

5. $(x - 6)(x + 9) = 0$

6. $3x^2 - 29 = 79$

7. $4x^2 + 4x - 10 = 7$

8. $3x^2 + 24x + 36 = 0$

9. $(5x - 2)(3x + 1) = 0$

10. $11x^2 - 2x = 24$

11. $4x^2 - 24x - 28 = 0$

12. $(2x + 3)^2 = 0$

HSA.REI.D.10 (USED FOR PLACEMENT)

1. The point $(1, 8)$ is a solution for the equation $y \geq 18x + 1$

- a. Sometimes
- b. No
- c. Not Enough Information
- d. Yes

2. Both $(-3, 1)$ and $(1, -2)$ are solutions for the equation $y > -2x^2 + 5$

- a. False
- b. True
- c. Sometimes
- d. Not Enough Information

3. The point $(3, 30)$ is a solution for the equation $y = 2x^2 + 12$

- a. Sometimes
- b. No
- c. Not Enough Information
- d. Yes

4. The point (5, 2) is a solution for the equation $y = 13x + 5$

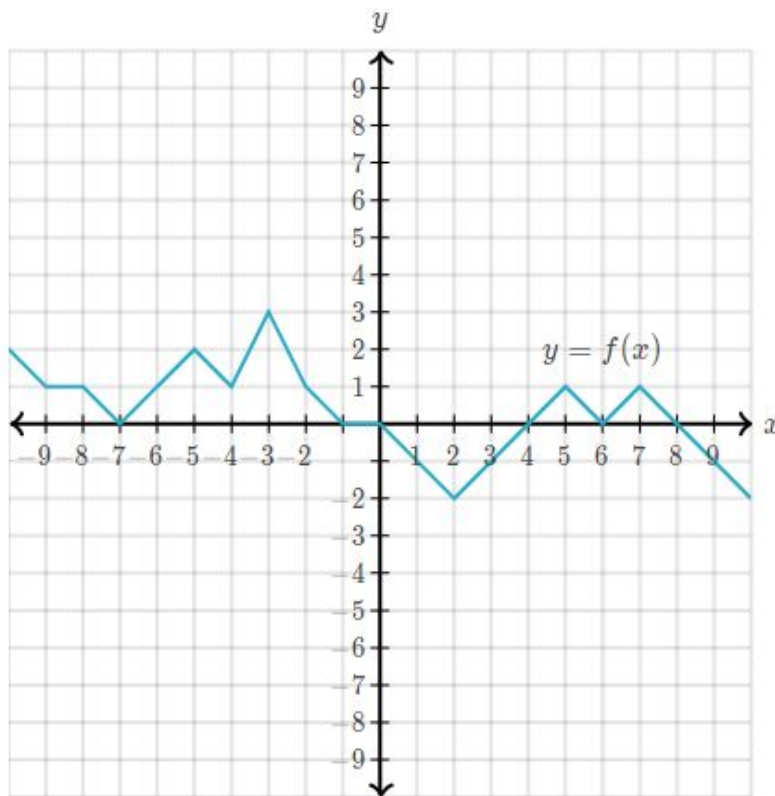
- a. Not Enough Information
- b. Yes
- c. No
- d. Sometimes

HSA.REI.D.11 (ONLY LINEAR PROBLEMS FROM THIS STANDARD USED FOR PLACEMENT)

1. Select all input values for which $f(x) = 3$ using the graph below.

Select all that apply

- a. $x = -5$
- b. $x = -3$
- c. $x = -1$
- d. None of the above



2. At which point do the two equations $3x + 5 = y + 4x$ and $y = x^2$ intersect?

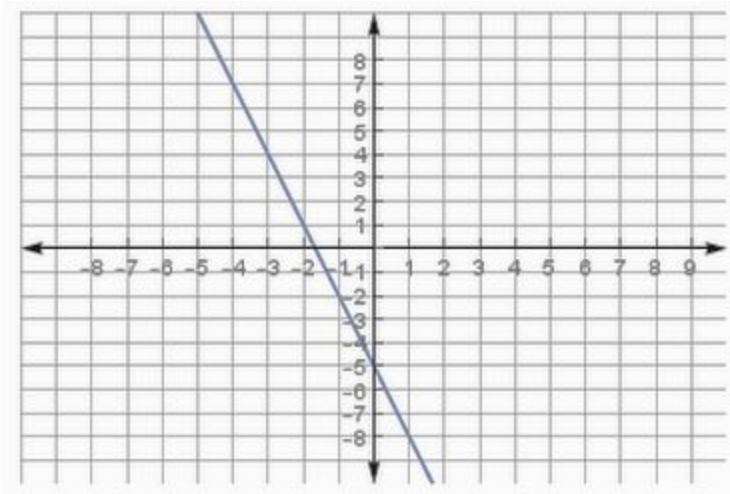
- (A) (1.8, 3.2) (B) (-2.8, 7.8) (C) (0, 5) (D) Both (A) and (B)

3. Find the intersection of the two equations $y = 17x + 1$ and $y = -24x + 68$.

- (A) (1.8, 45) (B) (0, 75) (C) (1.6, 29) (D) (18, 4)

HSA.REI.D.12 (USED FOR PLACEMENT)

Looking at the equation graphed below, is $(-1, -2)$ a solution? Why or why not?



HSF.IF.A.1 (USED FOR PLACEMENT)

1. Does the following represent a function? Explain how you know.

x	y
4	6
5	9
6	12
4	8

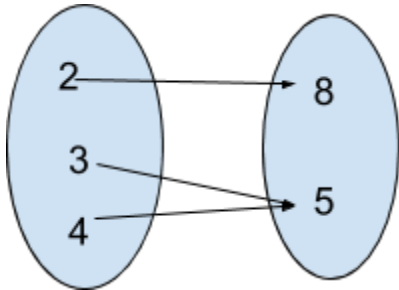
2. Does the following represent a function? Explain how you know.

x	y
3	2
4	4
5	6
6	8

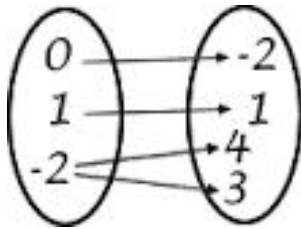
3. Does the following represent a function? Explain how you know.

x	y
-2	4
-1	1
1	1
2	4

4. Does the following represent a function? Explain how you know.



5. Does the following represent a function? Explain how you know.



6. Use the table below to answer the following question.

x	-5	0	-8	1	2	7	6	
y	-9	1	-15	5	5	15	13	9

What number(s) can be placed in the empty cell so that the table of values satisfies the definition of a function? Select **all** that apply.

- a. 1
- b. 4
- c. 9
- d. It's not possible to make this relation a function.

7. Which of the following numbers could be placed in the empty cell above so that the table of values satisfies the definition of a function? Select **all** that apply.

- a. 2
- b. 3
- c. 6
- d. It's not possible to make this relation a function.

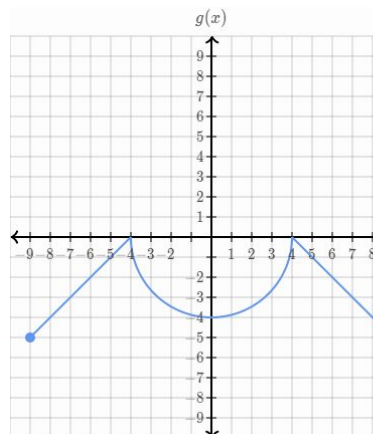
x	y
-2	-8
0	0
	12
4	16
6	24

HSF.IF.A.2 (USED FOR PLACEMENT)

1. If $f(x) = 4x - 12$, then what is $f(2)$?
2. If $f(x) = 2x^2 + 3$, then what is $f(-1)$?
3. If $g(x) = -3x^2$, then what is $g(-2)$?
4. If $f(x) = 9$, then what is $f(1)$?
5. Which statement **best** describes the meaning of $f(3) = 6$?
 - a. The output is 6 when the input is 3.
 - b. The output is $f(x)$ when the input is 3.
 - c. The output is 3 when the input is 6.
 - d. The output is $f(6)$ when the input is 3.
6. Which statement **best** describes the meaning of $f(4) = 9$?
 - a. The value of f times 4 is 9.
 - b. The output is 4 when the input is 9.
 - c. The output is 9 when the input is 4.
 - d. The output of $f(x)$ is 9.
7. John opened a bank account and deposited an initial sum. Let $B(t)$ represent the account balance in dollars, t days since the account was opened. What does $B(30) - B(0) = 50$ mean?

HSF.IF.B.4 (ONLY LINEAR PROBLEMS FROM THIS STANDARD USED FOR PLACEMENT)

1. Does the function $f(x) = -4x^2 + 2x + 1$ have a maximum point or a minimum point?
2. Use the graph below to answer the following questions:



- a) Domain
- b) Range
- c) Over what interval is the function increasing ?
- d) Over what interval is the function decreasing ?

HSF.IF.B.5 (ONLY LINEAR PROBLEMS FROM THIS STANDARD USED FOR PLACEMENT)

1. A local theater sells admission tickets for \$9.00 on Thursday nights. At capacity, the theater holds 100 customers. The function $M(n) = 9n$ represents the amount of money the theater takes in on Thursday nights, where n is the number of customers. What is the domain of $M(n)$ in this context? Select the correct answer.
 - a. All whole numbers
 - b. All non-negative rational numbers
 - c. All non-negative integers that are multiples of 9
 - d. All non-negative integers less than or equal to 100
2. Tanya walked for 17 minutes from her home to a friend that lives 1.5 kilometers away. Let $d(t)$ denote Tanya's remaining distance to walk (measured in kilometers, t minutes since she left home.

Which number type is more appropriate for the domain of the function?

- a. Integers
- b. Real Numbers

Define the interval of the domain:

3. Alice placed small glasses of water in her freezer at different occasions, each time setting the freezer to a different temperature within the possible range of -6 to -1 degree Celsius. When the temperature was -1 degrees Celsius, the water took 4 hours to freeze, which is the longest time. The shortest time was 2 hours, when Alice set the temperature to -6 degrees Celsius.

When Alice finished her experiment, she used her results to approximate the freezing time for any temperature within the measured range.

Let $T(t)$ denote the time T (measured in hours) it takes the water to freeze given that the set temperature is t degrees Celsius.

Which number type is more appropriate for the domain of the function?

- a) Integers
- b) Real Numbers

Define the interval of the domain:

HSS.ID.C.7 (USED FOR PLACEMENT)

1. DeeDee's Candy Shop sells chocolate bars for \$1.74 each and lollipops for \$0.60 each. The total sales for one day was \$5,040. Write an equation that models the relationship between the items sold and the money made. Let C represent the number of chocolate bars sold and L represent the number of lollipops sold
2. The function $C = 30h + 90$ represents the cost, C , in dollars of renting a truck for h hours. Each customer must pay a security deposit, plus a fee for each hour of the rental.
 - a. Based on the equation, how much is the security deposit?
 - b. Based on the equation, how much does it cost to rent the truck per hour?
 - c. How much would you expect to pay to rent the truck for 7 hours?

3. The function $C = 0.20m + 15$ gives the cost, C , in dollars of using a cellphone for m minutes. Each customer must pay a flat fee to use the phone every month, plus a fee for each minute spent talking on the phone.
- What does the number 0.20 represent in the context of the problem?
 - What would appropriate units be for the slope, 0.20, of the function?
 - What does the number 15 represent in the context of the problem?

8.EE.A.1 (NOT USED FOR PLACEMENT)

Evaluate the following expressions, leave your answer as a fraction if necessary.

1. -3^2

2. $\frac{4^3}{4 \cdot 4^7}$

3. 5^{-4}

4. $\left(\frac{2}{3}\right)^{-4}$

HSN.RN.A.2 (NOT USED FOR PLACEMENT)

Simplify the following expressions. Write all answers with positive exponents

1. $4m^{-7}$

2. $(-2b^4)^5$

3. $\frac{4^m}{4^z}$

4. $5^3 \cdot 5^{3+b}$

5. $x^2 \cdot x^3$

6. $\frac{x^5}{x^2}$

7. $b^4 \cdot b^2$

8. $x^3 \cdot x^{-7}$

9. $(2x^2)^4$

10. $\frac{3x^{-2}}{y^{-3}}$

11. $2y^5 \cdot 4y^{-3} \cdot y^4$

12. $j^{\frac{1}{2}}k^3 \cdot j^{\frac{3}{4}}$

13. $(3x)^3(x^{-5})$

HSF.IF.C.7.E (NOT USED FOR PLACEMENT)

Graph the following functions. Show at least three points.

1. $y = 3^x$

2. $y = -3^x$

HSF.IF.C.8.B (NOT USED FOR PLACEMENT)

1. Identify the initial amount and the growth rate (as a percent) for the following function:

$$y = 100(1 + 0.5)^t$$

2. Classify the function as exponential growth or exponential decay: $y = 0.55(3)^t$

3. Classify the function as exponential growth or exponential decay: $y = 3(0.55)^t$

4. Identify the initial amount and the growth rate (as a percent) for the following function:

$$y = 7.5(1.75)^t$$

5. Identify the initial amount and the decay rate (as a percent) for the following function:

$$y = 10(0.2)^t$$

6. Identify the initial amount and the decay rate (as a percent) for the following function: $y = 2\left(\frac{1}{4}\right)^t$

HSA.REI.C.6 (USED FOR PLACEMENT)

Solve the following systems using substitution or elimination. Write answer as an ordered pair if possible.

- $3x + 4y = -4$ AND $x + 2y = 2$ (for this problem, also report the SUM of the solutions $x + y$)
- $-2x + y = 6$ AND $4x - 2y = 5$
- $3x - y = 4$ AND $-9x + 3y = -12$
- $3x + 2y = 3$ AND $y = -x + 2$

Solve the following systems by graphing

5. $2x - 3y = 1$ AND $x + y = 3$

Solve the following system of three equations and three unknowns using back substitution.

Write your answer as an ordered triple (x, y, z)

6. $2x - 3y + z = -2$

$$3y - z = 8$$

$$z = 7$$

Set up a system of equations to answer the following.

7. A theater sold 90 tickets to a play.

Floor seats cost \$12 each and balcony seats cost \$10 each.

Total receipts were \$1000.

How many of each type were sold?

8. U-Haul charges a flat fee of \$19.95 plus \$0.79 per mile to rent a 10 foot truck

Budget Truck charges a flat fee of \$99 plus \$0.10 per mile for a 10 foot truck

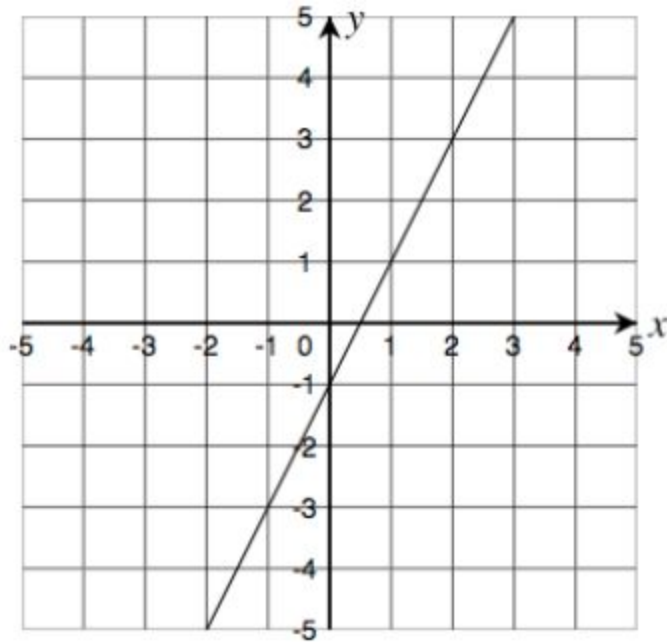
Find the **“break-even point”** for the number of miles travelled where the cost would be the same for the above two companies

HSF.IF.C.7.A (ONLY LINEAR PROBLEMS FROM THIS STANDARD USED FOR PLACEMENT)

1. Graph the line $x = 4$. Show at least three points
2. Graph the line $y = -2$. Show at least three points
3. Sketch the graph of $y = \frac{1}{3}x + 5$. Show at least three points
4. Sketch the graph of $8x - 4y = -24$. Show at least three points.
5. Graph the equation $y = x^2 + 2x - 3$. Show at least three points, one of which must be the vertex
6. Graph the equation $y = -2(x + 3)^2 + 8$. Show at least three points, one of which must be the vertex
7. Given the equation $y = -2x^2 + 8x - 4$
 - a. Determine whether the function will have a maximum or a minimum value and state which coefficient helped you determine the answer
 - b. Find the vertex of the parabola
8. Given the equation $y = 3x^2 - 12x + 7$
 - a. Determine whether the function will have a maximum or a minimum value and state which coefficient helped you determine the answer
 - b. Find the vertex of the parabola

HSF.IF.B.6 (USED FOR PLACEMENT)

1. Consider the linear function $f(x) = 2x - 1$ whose graph is shown.



Find the average rate of change of $f(x) = 2x - 1$ from $x = 0$ to $x = 1$.

2. Using the table, find the average rate of change from $x = 0$ to $x = 2$:

x	$f(x)$
0	5
1	1
2	-3
3	-7
4	-11

3. Three years after Bill bought a car, it was worth \$21500. Twelve years after he bought his car, it was worth \$6700. What is the yearly average rate of change of the value of Bill's car?